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INSTALLATION RESTORATION PROGRAM RECORDS SEARCH FOR DAVIS-MONTH--ETC(U)

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INSTALLATION RESTORATION
PROGRAM RECORDS SEARCH

For

DAVIS-MONTHAN AIR FORCE BASE, ARIZONA

Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403

AND

TACTICAL AIR COMMAND
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By

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Gainesville, Florida

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Contract No. F0863780 G0010 0012

NOTICE

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS USED IN THE TEXT

AFB	Air Force Base
AFESC	Air Force Engineering and Services Center
AFLC	Air Force Logistics Command
AFS	Air Force Station
AGE	Aerospace Ground Equipment
ARRS	Air Rescue and Recovery Squadron
AVGAS	Aviation Gasoline
Bldg.	Building
bls	Below Land Surface
CE	Civil Engineering
CES	Civil Engineering Squadron
cm/s	Centimeters per Second
COD	Chemical Oxygen Demand
CRS	Component Repair Squadron
CSG	Combat Support Group
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DoD	Department of Defense
DPDO	Defense Property Disposal Office
ECS	Electronic Combat Squadron
EMS	Equipment Maintenance Squadron
EPA	Environmental Protection Agency
°F	Degrees Fahrenheit
FAA	Federal Aviation Administration
ft	Feet
ft/day	Feet per Day
ft/ft	Feet per Foot
ft/min	Feet per Minute
gal	Gallons
gal/mo	Gallons per Month
gal/yr	Gallons per Year

gpd	Gallons per Day
gpm	Gallons per Minute
HARM	Hazardous Assessment Rating Methodology
ICBM	Intercontinental Ballistic Missile
in	Inches
IRP	Installation Restoration Program
JP	Jet Petroleum
lb/mo	Pounds per month
lb/yr	Pounds per Year
MASDC	Military Aircraft Storage and Disposition Center
Max.	Maximum
MEK	Methyl Ethyl Ketone
mg/l	Milligrams per Liter
mgd	Million Gallons per Day
MIMS	Missile Maintenance Squadron
Min.	Minimum
mo.	Month
MOGAS	Motor Gasoline
mph	Miles per Hour
msl	Mean Sea Level
NE	Northeast
NDI	Non-Destructive Inspection
No.	Number
NPDES	National Pollutant Discharge Elimination System
OEHL	Occupational and Environmental Health Laboratory
PCBs	Polychlorinated Biphenyls
PMEL	Precision Measurement Equipment Laboratory
POL	Petroleum, Oil, and Lubricants
ppb	Parts per Billion
ppm	Parts per Million
RCRA	Resource Conservation and Recovery Act
SAC	Strategic Air Command
SMW	Strategic Missile Wing
TAC	Tactical Air Command
TASS	Tactical Air Support Squadron
TCE	Trichloroethylene
TCF	Tactical Control Flight

TOC	Total Organic Carbon
TTW	Tactical Training Wing
USAF	United States Air Force

EXECUTIVE SUMMARY

A. INTRODUCTION

1. CH2M HILL was retained by the Air Force Engineering and Services Center (AFESC) on January 14, 1982, to conduct the Davis-Monthan Air Force Base (AFB) records search under Contract No. F0863780 G0010 0012, with funds provided by Tactical Air Command.

2. Department of Defense (DoD) policy was directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 dated 11 December 1981 and implemented by Air Force message dated 21 January 1982 as a positive action to ensure compliance of Air Force installations with existing environmental regulations. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. The purpose of DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health and welfare that may have resulted from these past operations.

3. To implement the DoD policy, a four-phase Installation Restoration Program has been directed. Phase I, the records search, is the identification of potential problems. Phase II (not part of this contract) consists of follow-on field work as determined from Phase I. Phase II consists of a preliminary survey to confirm or

rule out the presence and/or migration of contaminants and, if necessary, additional field work to determine the extent and magnitude of contaminant migration.

Phase III (not part of this contract) consists of a technology base development study to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those efforts which are required to control identified hazardous conditions.

4. The Davis-Monthan AFB records search included a detailed review of pertinent installation records, contacts with 11 government agencies for documents relevant to the records search effort, and an onsite base visit conducted by CH2M HILL during the week of April 19 through April 23, 1982. Activities conducted during the onsite base visit included interviews with 50 past and present base employees, ground tours of base facilities, and a helicopter overflight to identify past disposal areas. The installations addressed in the records search include Davis-Monthan AFB, 18 Titan Missile Sites, and Mt. Lemmon Air Force Station (AFS).

B. MAJOR FINDINGS

1. The major industrial operations at Davis-Monthan AFB involving hazardous chemicals and wastes have been in existence since the early 1940's. The major industrial operations include propulsion shops, pneudraulic shops, aerospace ground-equipment maintenance shops, non-destructive inspection labs, and corrosion

control shops. These industrial operations generate varying quantities of waste oils, fuels, solvents, and cleaners. The standard procedures for the disposition of the majority of the waste oils, fuels, solvents, and cleaners has been (1) fire department training exercises, landfill, and discharge to the sanitary sewer (1941 to 1946); (2) road oiling, landfill, discharge to the sanitary sewer, and fire department training exercises (1946 to 1976); (3) contractor collection and removal, and collection by oil/water separators which are connected to the sanitary sewer (1976 to 1979); (4) segregation and conveyance to DPDO for sale to a contractor or contractor removal (1979 to present).

2. Interviews with past and present base employees resulted in the identification of 34 past disposal or spill sites at Davis-Monthan AFB and the approximate dates that these sites were used (see Figure 16 for site locations).

3. Recent analyses of active base water supply wells and several off-base wells (downgradient and in close proximity to Davis-Monthan AFB) for heavy metals, pesticides, and trichloroethylene (TCE) indicate no presence of hazardous contaminants in the area ground water.

4. Interviews with past and present employees resulted in the identification of a sump drainage ditch at each of the 18 Titan Missile Sites. No disposal or spill sites were identified at Mt. Lemmon AFS.

C. CONCLUSIONS

1. No direct evidence was found to indicate that migration of hazardous contaminants exists within or beyond Davis-Monthan AFB boundaries. Recent analyses of base wells and nearby off-base wells indicate that hazardous contaminants are not present in the Davis-Monthan AFB area ground water.

2. Information obtained through interviews with 50 past and present base personnel, base records, shop folders, and field observations indicates that hazardous wastes have been disposed of on Davis-Monthan AFB property in the past.

3. The records search indicated that no large-scale use of TCE has occurred at Davis-Monthan AFB in the past; therefore, the potential for a large-scale TCE contamination problem at Davis-Monthan AFB is considered to be low.

4. No evidence of environmental stress resulting from past disposal of hazardous wastes was observed at Davis-Monthan AFB.

5. The potential for migration of hazardous contaminants is low because of (1) low ground-water table, (2) extremely low precipitation, (3) extremely high evaporation rate, and (4) the presence of a low-permeability layer just below the ground surface. Although low, the potential for contaminant migration exists because of (1) moderate permeability of the soil beneath the low-permeability layer, and (2) the absence of continuous impermeable confining strata in the

unsaturated zone above the water table. It is possible that hazardous contaminants may be migrating through the unsaturated zone and may not yet have reached the water table.

6. Table 1 presents a priority listing of the rated sites and their overall scores. The following sites were designated as areas showing the most significant potential (relative to other Davis-Monthan AFB sites) for environmental impact.

   a. The main base landfill (Site No. 1).

   b. Several drainage ditch and storm drain outfall points (Sites 17, 18, 19, 20 and 21).

   c. The major MASDC tow roads (Site No. 25).

   d. Two transformer oil spill sites (Site 7 and 8).

   e. The chemical sludge burial site (Site No. 10).

7. The remaining rated sites (Sites No. 2, 3, 4, 5, and 26) are not considered to present significant environmental concerns. Therefore, these sites do not warrant additional study.

8. The records search did not indicate any significant environmental concerns for the Titan Missile drainage ditch sites or Mt. Lemmon AFS. Therefore, additional study is not warranted.

Table 1

PRIORITY LISTING OF DISPOSAL SITES

Site No.	Site Description	Overall Score
1	Main Base Landfill	65
18	MASDC Flush Farm Drainage Ditch	61
25	MASDC Tow Road	60
7	Old Electrical Substation Site	59
19	Runway No. 4 Drainage Ditch	59
21	Storm Drain Outfall Location No. 2	58
20	Storm Drain Outfall Location No. 1	56
10	Chemical Sludge Burial Site	56
17	MASDC/Ammo Area Drainage Ditch	56
3	Existing Fire Department Training Area	55
8	Transformer Oil Spill Site	52
4	North Ramp Fire Department Training Area	52
5	Abandoned Fire Department Training Area	50
26	Fuel Tank Sludge Burial Site	49
2	MASDC Landfill	48

D. RECOMMENDATIONS

1. A limited Phase II monitoring program is suggested to confirm the absence of hazardous contaminants and migration at the above priority sites. Details of the recommended monitoring program are provided in Section VI of the report. The priority for monitoring at Davis-Monthan AFB is considered moderate, since no imminent hazard has been determined.

2. The final details of the monitoring program, including the exact locations of ground-water monitoring wells and soil sampling points, should be finalized as part of the Phase II program. It is not the intent of Phase I to assess the exact locations or depth of any ground-water monitoring wells or soil sampling points, but to provide guidance for the Phase II Contractor.

3. In the event that contaminants are detected, a more extensive field survey program should be implemented to determine the extent of contaminant migration. The Phase II Contractor should be responsible for evaluating the results of the program outlined above and for recommending additional monitoring, as appropriate.

4. In-House Environmental Monitoring Program

In addition to the limited Phase II monitoring, it is recommended that the following program be conducted by the base.

a. The base should continue its routine program of comprehensive sampling and analysis of active base water supply wells. It is

recommended that a volatile organic compound analysis be routinely included in addition to the analyses currently performed. This monitoring is recommended as a precautionary measure to determine if a long-term contaminant migration potential exists.

b. As a precautionary measure, the base should determine the condition of existing waste storage tanks through the use of pressure testing for leaks.

I. INTRODUCTION

A. BACKGROUND

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The current Department of Defense (DoD) Installation Restoration Program (IRP) policy was directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 dated 11 December 1981 and implemented by Air Force message dated 21 January 1982 as a positive action to ensure compliance of military installations with existing environmental regulations. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DoD facilities, to control the migration of hazardous contamination, and to control hazards to health and welfare that may have resulted from these past operations. The IRP will be a basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980.

To conduct the Installation Restoration Program records search for Davis-Monthan AFB, the AFESC retained CH2M HILL on January 14, 1982 under Contract No. F0863780 G0010 0012 using funding provided by the Tactical Air Command (TAC). The installations included in the records search are Davis-Monthan AFB, Mt. Lemmon Air Force Station, and the 18 Titan Missile Sites. The Titan Missile Sites and Mt. Lemmon Air Force Station are discussed separately in Chapters VII

and VIII, respectively. The location map of Davis-Monthan AFB is shown on Figure 1 and the site map of Davis-Monthan AFB is shown on Figure 2.

The records search comprises Phase I of the DoD Installation Restoration Program and is intended to review installation records to identify possible hazardous waste-contaminated sites and to assess the potential for contaminant migration from the installation. Phase II (not part of this contract) consists of follow-on field work as determined from Phase I. Phase II consists of a preliminary survey to confirm or rule out the presence and/or migration of contaminants and if necessary, additional field work to determine the extent and magnitude of the contaminant migration. Phase III (not part of this contract) consists of a technology base development study to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those efforts which are required to control identified hazardous conditions.

B. AUTHORITY

The identification of hazardous waste disposal sites at Air Force installations was directed by Defense Environmental Quality Program Policy Memorandum 81-5 (DEQPPM 81-5) dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations.

C. PURPOSE OF THE RECORDS SEARCH

DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites and spill sites on DoD facilities, control the

migration of hazardous contamination from such facilities, and control hazards to health or welfare that may have resulted from these past operations. The existence and potential for migration of hazardous material contaminants was evaluated at Davis-Monthan AFB by reviewing the existing information and conducting an analysis of installation records. Pertinent information includes the history of operations, the geological and hydrogeological conditions which may contribute to the migration of contaminants and the ecological settings which indicate environmentally sensitive habitats or evidence of environmental stress.

D. SCOPE

The records search program included a pre-performance meeting, a preliminary coordination meeting, an onsite base visit, a review and analysis of the information obtained, and preparation of this report.

The pre-performance meeting was held at Davis-Monthan AFB, Arizona, on Feburary 4, 1982. Attendees at this meeting included representatives of AFESC, USAF OEHL, Tactical Air Command, Davis-Monthan AFB, and CH2M HILL. The purpose of the pre-performance meeting was to provide detailed project instructions, to provide clarification and technical guidance by AFESC, and to define the responsibilities of all parties participating in the Davis-Monthan AFB records search.

A CH2M HILL representative conducted a preliminary visit to Davis-Monthan AFB on April 8 and 9, 1982 to become familiar with the installation and to prepare for the records search team base visit.

The onsite base visit was conducted by CH2M HILL from April 19 through April 23, 1982. Activities performed during the onsite visit included a detailed search of

installation records, ground and aerial tours of the installation, and interviews with 50 past and present base personnel. At the conclusion of the onsite base visit, the deputy group commander was briefed on the preliminary findings. The following individuals comprised the CH2M HILL records search team:

1. Mr. Norman Hatch, Project Manager (M.S. Chemistry, 1972; M.S. Environmental Engineering, 1973)

2. Mr. Greg McIntyre, Assistant Project Manager (M.S. Environmental and Water Resources Engineering, 1981)

3. Mr. Gary Eichler, Hydrogeologist (M.S. Engineering Geology, 1974)

4. Dr. Robert Knight, Ecologist (M.S. Environmental Chemistry and Biology, 1973; Ph.D. Systems Ecology, 1980)

Resumes of these team members are included in Appendix A. Government agencies were contacted for information and relevant documents. Appendix B lists the agencies contacted.

Individuals from the Air Force who assisted in the Davis-Monthan AFB records search included the following:

1. Mr. Bernard Lindenberg, AFESC, Program Manager, Phase I

2. Major Gary Fishburn, USAF OEHL, Program Manager, Phase II

3. Mr. Gil Burnet, TAC, Command Program Manager, Phase I

4. Mr. H.K. Poole, Davis-Monthan AFB, Environmental Coordinator

5. Mr. Curtis Lueck, P.E., Davis-Monthan AFB, Chief of Environmental Planning

E. METHODOLOGY

The methodology utilized in the Davis-Monthan AFB records search is shown graphically on Figure 3. First, a review of past and present industrial operations is conducted at the base. Information is obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from the various operating areas of the base. The information obtained from interviewees on past activities is based on their best recollection. A list of 50 interviewees from Davis-Monthan AFB, with areas of knowledge and years at the installation, is given in Appendix C.

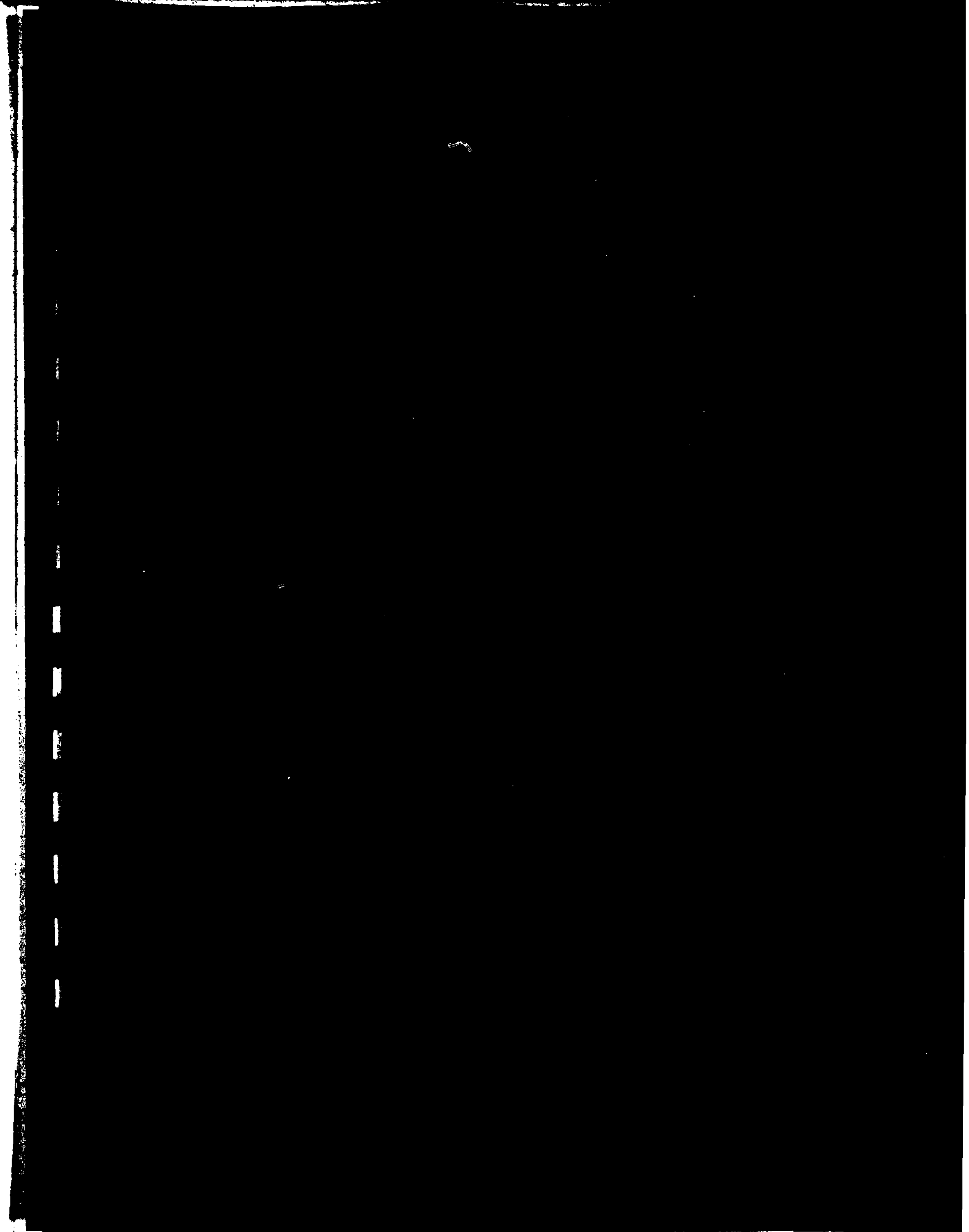
The next step in the activity review process is to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from all the industrial operations on the base. Included in this part of the activity review is the identification of past landfill sites and burial sites; as well as other possible sources of contamination such as major PCB or solvent spills, or fuel-saturated areas resulting from large fuel spills or leaks.

An aerial overflight and a general ground tour of identified sites is then made by the records search team to gather site-specific information including evidence of environmental stress and the presence of nearby drainage ditches or surface-water bodies. These water bodies are inspected for any evidence of contamination or leachate migration.

A decision is then made, based on all of the above information, as to whether a potential exists for hazardous material contamination from any of the identified sites. If not, the site is deleted from further consideration. If minor operations and maintenance deficiencies are noted during the investigations, the condition is reported to the Base Environmental Coordinator for remedial action.

For those sites at which a potential for contamination is identified, the potential for migration of this contamination is evaluated by considering site-specific soil and ground-water conditions. If there is no potential for contaminant migration, but other environmental concerns were identified, the site is referred to the base environmental monitoring program for further action. If no further environmental concerns are identified, the site is deleted from consideration. If the potential for contaminant migration is identified, then the site is rated and prioritized using the site rating methodology described in Appendix J, "Hazard Assessment Rating Methodology."

The site rating indicates the relative potential for environmental impact at each site. For those sites showing a significant potential, recommendations are made to quantify the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a low potential, no Phase II work would be recommended.



II. INSTALLATION DESCRIPTION

A. Location

Davis-Monthan AFB is located in Pima County, Arizona, directly southeast and adjacent to the City of Tucson. Both Davis-Monthan AFB and the City of Tucson are situated in a valley which is partially surrounded by foothills and mountains; 12 miles to the north are the Santa Catalina Mountains; 10 miles to the east are the Rincon Mountains; and 20 miles to the south are the foothills of the Santa Rita Mountains. Davis-Monthan AFB is situated on 10,763 acres of land and owns or leases an additional 4,543 acres of land allocated to off-base installations.

B. Organization and Mission

Davis-Monthan AFB is the outgrowth of the original municipal airport established by the citizens of Tucson in 1919. Initial construction of the base did not begin until 1927 and various construction programs continued through 1937. Shortly after the attack on Pearl Harbor in 1941, the base was expanded and transformed into one of the major heavy bombardment training stations in the nation. In October, 1945, Davis-Monthan AFB was designated an Air Technical Service Command Storage Area, and today a large portion of the base is provided to an Air Force Logistics Command (AFLC) unit for aircraft storage, reclamation, and disposal operations.

An important milestone in Davis-Monthan AFB's history was its selection in 1960 as the site of the operational Titan II ICBM Missile Wing. In addition, on October 1, 1976, after serving as a Strategic Air Command Base for 30 years, Davis-Monthan AFB became a Tactical Air Command

Base and the mission changed from primarily deterrence to primarily tactical training.

The 836th Air Division of the Tactical Air Command was established at Davis-Monthan AFB on January 1, 1981 and is responsible for administrative, medical, and logistical support of all assigned units. The 836th Air Division also supervises training of combat air crews for assignment to tactical units worldwide. The 836th Air Division commands the 355th Tactical Training Wing, the 836th Combat Support Group, Resource Management, and the Davis-Monthan Hospital. There are approximately 140 aircraft currently assigned to Davis-Monthan AFB including OA-37B, A-10A, F-106A, and EC-130H fixed wing aircraft and HH-1H helicopters. The total work force on Davis-Monthan AFB numbers approximately 8,940, of whom 7,034 are assigned military; 1,366 are assigned civil service; and 540 are non-appropriated funds employees.

The organizations and tenants at Davis-Monthan AFB are listed below:

-- 836th Air Division
-- 355th Tactical Training Wing
-- Resource Management
-- 836th Combat Support Group
-- USAF Hospital
-- 390th Strategic Missile Wing
-- 23rd Tactical Air Support Squadron
-- Military Aircraft Storage and Disposition Center (MASDC)
-- 5th Fighter Interceptor Squadron
-- 1903rd Communication Squadron
-- 390th Communication Squadron
-- 4444th Operating Squadron
-- Air Force Audit Agency

-- Detachment 1703, Air Force Office of Special Investigation
-- Detachment 1, 37th Air Rescue and Recovery Squadron
-- Detachment 13, 25th Weather Squadron
-- Detachment 17, 4400th Management Engineering Squadron
-- 83rd Tactical Control Flight
-- 512th Field Training Detachment
-- Federal Aviation Administration (FAA) Radar Approach Control Facility
-- U.S. Customs Air Support Branch
-- 868th Tactical Missile Training Squadron
-- 41st Electronic Combat Squadron

A more detailed description of the base history and its mission is included in Appendix D.

III. ENVIRONMENTAL SETTING

A. Meteorology

Located between 2,500 feet and 2,900 feet above sea level in the Sonoran Desert of Arizona, Davis-Monthan AFB has a warm semi-arid climate, characteristic of much of the southwestern United States. Climatic factors are largely influenced by a latitudinal high pressure zone, distance from major water bodies, and the presence of mountain ranges partially surrounding the base.

Summer weather is dominated by convectional and orographic phenomena creating frequent, isolated thunderstorms, as well as infrequent tropical storms from the Pacific Ocean. The short winter is characterized by clear, mild weather with intermittent overcast periods and light rain caused by frontal activity.

The annual average temperature for Davis-Monthan AFB is approximately 68°F, with average daily maximum and minimum temperatures of 81°F and 56°F, respectively (Table 2).

The long, hot season, extends from April through October, with an average of 41 days annually with maximum temperatures over 100°F. The maximum recorded temperature at the base was 112°F, and the minimum temperature recorded was 17°F. Some relief from high temperatures is provided by a low average relative humidity of 37 percent.

Precipitation at Davis-Monthan AFB averages about 10 inches per year, with nearly half this quantity falling between July and September in the form of summer thunderstorms. A secondary rainy season is centered around December, while the months of April, May, and June are typically the driest, with less than 0.5 inches of rainfall

Table 2
METEOROLOGICAL DATA SUMMARY FOR DAVIS-MONTHAN AFB, PIMA COUNTY, ARIZONA[a]

Parameter	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
TEMPERATURE (°F)													
Highest	88	89	92	102	106	112	111	111	108	101	91	84	112
Average Maximum	64	67	71	80	89	98	98	96	93	84	73	65	81
Average Minimum	40	42	45	51	59	69	74	73	69	58	47	41	56
Lowest	17	23	22	31	37	50	63	64	47	31	26	20	17
PRECIPITATION (inches)													
MEAN	.73	.65	.71	.32	.08	.20	1.97	1.76	1.09	.81	.62	1.00	9.94
SNOWFALL (inches)													
MEAN	.3	T[b]	.1	T	T	0	0	0	0	0	.2	.3	.9
RELATIVE HUMIDITY (%)													
MEAN	47	42	37	27	21	22	42	47	38	36	40	47	37

Notes:

[a]Period of Record: 1945 - 1978.

[b]T denotes less than 0.05 inch.

(Source: Department of the Air Force, Davis-Monthan AFB, Pima County, Arizona).

per month. The mean annual lake evaporation rate in the Tucson area is approximately 65 inches per year. The net precipitation for the Davis-Monthan AFB area (mean annual precipitation minus mean annual evaporation) is approximately -55 inches per year, which provides a low driving force for contaminant migration.

Wind patterns are influenced by the orientation of topographic features such as the valleys and mountain slopes. Prevailing winds are from the southeast during much of the year; however, variable temperature gradients between the adjacent mountains and the valley floor result in diurnal patterns, with winds from the west and northwest during the heat of the day and from the southeast at night and during the early morning hours. Average winds are typically less than 10 miles per hour at Davis-Monthan AFB; however, a maximum speed of nearly 60 miles per hour has been recorded at the nearby municipal airport.

B. GEOLOGY

Davis-Monthan AFB is located within the Sonoran Desert section of the Basin and Range physiographic province (see Figure 4). The province, in general, is characterized by north to northwest-trending isolated mountain ranges separated by desert plains. In the Mexican Highlands section, mountains make up nearly half of the area and include many timber-clad ranges with peaks more than 9,000 feet above mean sea level (msl). The mountain ranges are separated by desert plains or basins. Davis-Monthan AFB is located in one of these basins referred to as the Tucson Basin. This basin is a broad 1,000-square-mile area in the upper Santa Cruz River drainage basin. The basin is partially surrounded by mountain ranges, including the Santa Rita, Empire, Rincon, Tanque Verde, Santa Catalina, and Tortolita Mountains to the east and north and the Sierrita,

Black, and Tucson Mountains to the west. The ranges to the east and north are at altitudes of 6,000 to 8,000 feet, with peaks such as Mt. Lemmon at altitudes greater than 9,000 feet above msl. The ranges to the west are between 3,000 and 6,000 feet above msl.

The Tucson Basin is drained by the Santa Cruz River, which flows through the basin in a northwesterly direction. In the vicinity of Davis-Monthan AFB the river flows almost due north and is located approximately 1.75 miles west of the base. Major tributaries of the Santa Cruz River in the vicinity of Davis-Monthan AFB include Rillito Creek, located approximately 4.5 miles north of the base; Julian Wash, located approximately 1 mile southwest of the base; and Pantano Wash, located approximately 0.5 mile northeast of the base. Rillito Creek flows west, discharging into the Santa Cruz River. Pantano Wash flows northwest, discharging into Rillito Creek. Julian Wash flows northwest, discharging into the Santa Cruz River.

The low amount and irregularity of rainfall in the Arizona desert result in erratic natural flows in the Santa Cruz River and its tributaries. These drainageways, like many in the Desert Southwest area, are dry most of the year and flow only during and immediately following storms. To optimize surface-water resources and, at the same time, prevent flood damage from infrequent but sometimes severe storms, many drainage ditches and canals have been constructed.

Surface drainage on-base has been modified by a series of ditches which ultimately discharge directly or indirectly to the Santa Cruz River. Runoff from the northwest half of the base generally flows through ditches, leaving the base at the northwest corner and discharging to the Santa Cruz

River. Runoff from the remainder of Davis-Monthan AFB (primarily the southeast half) is captured by two unnamed washes which traverse the base in a northeasterly direction, discharging to a small retention pond located off-base approximately 1 mile from the boundary. Overflow from this retention pond discharges to Pantano Wash.

Elevations on-base range from 2,550 feet to 2,900 feet above mean sea level, with ground surface sloping gently downward to the northwest (see Figure 5).

The most significant soil associations occurring at Davis-Monthan AFB (to a depth of approximately 60 inches) consist of deep, well-drained soils on valley plains and stream terraces. These soils are formed in recent alluvium derived from a wide mixture of rock type, including andesite, basalt, schist, rhyolite, and granite-gniess. Preliminary soil classifications have been made at Davis-Monthan AFB by the U.S. Department of Agriculture, soil conservation service. Figure 6 indicates the soil associations occurring at the base. Most of Davis-Monthan AFB is covered with gravelly, and/or sandy loam to a depth of approximately 3 feet. The loam is underlain by a calcareous loam to a depth of approximately 4 feet. Permeabilities of the soils (to a depth of approximately 60 inches) at Davis-Monthan are low to moderate, ranging from 3×10^{-4} to 3×10^{-3} feet/min.

Geologically, Davis-Monthan AFB lies within an alluvium-filled basin, partially surrounded by basement (crystalline) mountain ranges (see Figure 7). In general, the source for the alluvium is the crystalline rock, granite, granite-gniess, schist, andesite, basalt, and limestone, which eroded from the nearby mountains, and were transported by wind and water. These deposits are, for the

most part, unconsolidated sediments of variable thickness which were deposited during Pliocene and Quaternary time (less than 10 million years ago). Their thickness varies from a few feet at the periphery of the Tucson Basin adjacent to the mountains to greater than 5,000 feet at the center of the basin (see Figure 8). The unconsolidated sediments are deposited on top of basement rock which is probably of the same composition as the surrounding mountain ranges.

No wells have penetrated the entire thickness of the alluvium to bedrock except at the periphery of the basin. At Davis-Monthan AFB wells range in depth from 405 feet to just over 1,000 feet. Figure 9 illustrates the geologic logs and well construction details of two wells on-base, one at the northwest end and the other a much shallower well at the southeast end of the base. Figure 10 illustrates the location of base wells and some offsite wells owned by the City of Tucson.

The nature of the alluvial deposits in the Davis-Monthan AFB vicinity is quite variable. The sediments, as mentioned above, were all derived from crystalline rock. In general, most of the deposit was emplaced by running water which eroded the parent rock, transported the sediments away from the uplands, and deposited them in the lowland basin. The finer-grained materials, such as silts and clays, were deposited at low velocity during flood stage where rivers overflowed their banks. These materials were deposited on the adjacent terrace or at the river mouth where alluvial fans were being formed. Coarser materials, i.e., sands and gravels, were deposited within the stream bed itself. These deposits were distributed laterally by the constantly changing stream course. The great thickness of unconsolidated and therefore compressible sediments occurring at Davis-Monthan AFB and the immediate vicinity is a contributing factor to the land subsidence common to the area.

C. HYDROLOGY

A low precipitation rate (10 inches/year) and a high evaporation rate (65 inches/year) are common to the Davis-Monthan AFB area. Surface streams and rivers are dry most of the time, and convey water only during and immediately following storms. The Santa Cruz River, flowing northwesterly, provides the main drainage for the Tucson Basin including Davis-Monthan AFB.

Ground water occurs within the unconsolidated alluvial deposits consisting of inter-fingering sand, gravel, silt and clay. The saturated thickness of these sediments is extremely variable, being thin (less than 200 feet) toward the mountains and thickening (greater than 5,000 feet) toward the center of the basin (see Figure 8). Figure 11 illustrates the distribution of recoverable ground water in the vicinity of the base. Ground water is recharged at the basin periphery and by stream bed infiltration along the Santa Cruz River and its tributaries (see Figure 12).

In general, the aquifer beneath Davis-Monthan AFB is comprised of the Pantano Formation (the oldest and deepest formation), the Tinaja Beds, the Fort Lowell Formation, and in places the surficial deposits underlying the flood plains and channels of the major streams. The units forming this aquifer are loosely consolidated to strongly cemented and have a combined thickness of more than 5,000 feet.

The various formations which comprise this aquifer generally act as a single unconfied hydrologic unit. Locally, however, due to the occurrence of discontinuous strata of low permeability, the aquifer may act as a leaky artesian rather than an unconfined aquifer.

The Pantano Formation is the lowermost unit into which wells are completed in the vicinity of Davis-Monthan AFB. At

Davis-Monthan AFB the top of this formation occurs at approximately 1,300 feet above msl or 1,400 feet deep. The formation is typically composed of silty sandstone, sand, and gravel.

The Pantano Formation is overlain by the Tinaja Beds. These beds consist of gravel and sand that grade into a very thick sequence of gypsiferous clayey silt and mud stone in the center of the basin. At the Davis-Monthan AFB, the top of the Tinaja Beds occurs at approximately 2,300 feet above msl or approximately 300 feet below land surface. Most of the wells constructed at Davis-Monthan AFB are completed into the Tinaja Beds.

The Fort Lowell Formation overlies the Tinaja Beds and consists of gravel near the edge of the basin, grading to silt in the center. The Fort Lowell Formation occurs from approximately 2,500 feet to 2,220 feet above msl at Davis-Monthan AFB. Overlying the Fort Lowell Formation is a thin layer (less than 50 feet) of surficial deposits emplaced by the present surface drainage system.

Figure 8 illustrates the distribution and thickness of the alluvial deposits of the above-mentioned formations in which ground water occurs.

The formations which comprise the aquifer of the Tucson Basin generally act as a more or less single hydrologic unit. The formations are distinguished primarily on the basis of color, rock-fragment content, degree of cementation, and spatial position. The units have been distinguished because their hydrologic characteristics are different; the younger sedimentary rocks store and transmit the largest quantities of ground water per unit volume because the older, more deeply buried sediments are more compressed and therefore less porous and permeable.

Aquifer transmissivities in the Tucson Basin range from 1,000 to almost 500,000 gallons per day per foot (gpd/ft). However, in most places, the aquifer has a transmissivity of 50,000 gpd/ft or less. Specific capacities of wells commonly range from 5 to 100 gallons per minute per foot (gpm/ft) of drawdown.

Aquifer characteristics in the Tucson Basin aquifer are controlled somewhat by geologic structure as well as degree of cementation and compaction. Hydraulic head generally increases with depth except in the vicinity of faults. Water levels in wells on or near faults generally are anomalous and can be either higher and lower than water levels in nearby wells. Faults sometime act to hydraulically connect deeper portions of the aquifer, under a higher hydraulic head, with shallower zones thus resulting in a higher reported water level than would be expected for a given well. The reverse is also true,and wells drilled deep into the aquifer have shown a much lower head than expected due to the effects of connection by way of a fault with shallower zones under lower hydraulic head.

In the vicinity of Davis-Monthan AFB, the Pantano Formation, the Tinaja Beds, and the Fort Lowell Formation are the primary sources of water. Most of the base wells withdraw water from the Tinaja Beds, with some contribution from the Fort Lowell Formation.

Ground-water withdrawals in the Tucson Basin have increased significantly over the past 20 years. Most of the increased ground-water withdrawals are used for agricultural irrigation and municipal water supply. The increased use of ground water in the Tucson Basin has caused a number of changes in the hydrogeologic regime. Figure 13 illustrates the elevation of the ground water in 1981.

Figure 14 illustrates the decline in ground-water levels from the period 1947 to 1975 (over 100 feet in the vicinity of Davis-Monthan AFB). The base itself, using only 2 million gallons per day (mgd), contributes very little to this decline in water level. Water levels at Davis-Monthan are currently 250 to 350 feet below land surface (2,350 to 2,450 feet above msl). Water levels are declining because ground-water withdrawals are significantly higher than recharge; thus water is being "mined" from storage in the aquifer and not being replaced by recharge. This decline in water level in the unconsolidated formations of the Tucson Basin has resulted in some land subsidence; however, not to the degree experienced in central Arizona. Subsidence is an expected phenomenon of an unconsolidated compressible aquifer which is being dewatered. Under normal conditions, in saturated unconsolidated materials, the void space is filled with water, which tends to partially offset the weight of the solid material due to the buoyancy effect of water. Because of the large ground-water withdrawals in the area, this buoyancy effect has decreased and the overlying sediments have begun to settle by compaction.

Fissures and cracks normally associated with land subsidence have not yet appeared in the Davis-Monthan AFB vicinity. Should they begin to develop, they would be of some concern in terms of contaminant migration because the fissures sometimes extend down to the water table, thereby providing a direct pathway to the ground-water system from the surface.

In the absence of fissures or cracks, surface or shallow contamination would have to move vertically through more than 300 feet of unsaturated sediments before reaching the water table. Studies on irrigated lands in central Arizona have shown that downward flow rates in unsaturated materials are estimated at less than 10 feet per year. Therefore, it would take more than 30 years for irrigation

water applied at the surface to reach the water table, which is declining at the rate of 2 feet per year. Vertical migration in unirrigated areas would take even longer. This is significant not only from the standpoint of recharge but also from the standpoint of contaminant migration.

Figure 13 depicts the elevation of ground water relative to mean sea level in the Tucson Basin, and also illustrates the direction of ground-water flow. Ground-water flows perpendicular to the contour lines. Ground-water flow then is toward the northwest in the vicinity of Davis-Monthan AFB, i. e., parallel to the Santa Cruz River.

Ground-water quality in the vicinity of Davis-Monthan AFB is acceptable for most uses. Water in the lower part of the aquifer has a lower hardness content than in the upper part. Naturally occuring fluoride concentrations at depths greater than 1,000 feet may be slightly elevated. Figure 15 illustrates the distribution of dissolved solids in ground water within the Tucson Basin. Table 3 lists the most recent water quality analyses from two wells considered to be representative at Davis-Monthan AFB. One well (No. 8) is shallow (426.5 feet) and is located at the southeast end of the base; the other well (No. 9) is fairly deep (750 feet) and is located in the north-central portion of the base. Based on this table, all parameters are within primary drinking water standards. The iron level is elevated, probably due to corrosion of the well casing. In addition, all base wells have been sampled for TCE; none was detected. The City of Tucson recently sampled 12 to 15 wells, most adjacent to and downgradient of Davis-Monthan AFB, for TCE; none was detected.

Table 3
WATER QUALITY CHARACTERISTICS OF SELECTED WELLS AT DAVIS-MONTHAN AFB

Parameter[a]	Well No. 9[b]	Well No. 8[b]	EPA Primary Drinking Water Standards
Total Depth (ft)	750	426.5	
Perforated Section (ft)	340 to 685	344 to 424	
Arsenic	<0.01	<0.01	0.05
Barium	<1.0	<1.0	1.0
Cadmium	<0.01	<0.01	0.01
Chromium	<0.05	<0.05	0.05
Lead	<0.02	<0.02	0.05
Mercury	<0.002	<0.002	0.002
Selenium	<0.01	<0.01	0.01
Silver	<0.01	<0.01	0.05
Copper	0.075	0.451	--
Iron	0.423	5.020	--
Manganese	<0.05	<0.05	--
Zinc	<0.05	0.646	--
Calcium as Ca	38.3	22.7	--
Magnesium as Mg	5.7	4.3	--
Potassium	1.6	1.1	--
Sodium	30.8	17.6	--
Alkalinity, total as $CaCO_3$	120	106	--
Chloride	8	8	--
Hardness as $CaCO_3$	119	74	--
Residue, Filterable (TDS)	144	140	--
Residue, Non-filterable (SS)	3	1	--
Residue	147	141	--
Specific Conductance (μmhos/cm)	230	230	--
Sulfate as SO_4	7	9	--
Nitrate as N	1.0	1.4	10
Fluoride	0.3	0.2	1.4 to 2.4
Turbidity, JTU	1	3	
Silica	26.0	28.0	

Source: USAF OEHL, Brooks AFB, Texas

[a]Parameters are in mg/l unless otherwise noted.

[b]Sampled February 6, 1981

D. ENVIRONMENTALLY SENSITIVE CONDITIONS

1. Habitat

Approximately 50 percent of the land area of Davis-Monthan AFB is inhabited by native plant and animal communities. The vegetational habitat of the base is classified as Sonoran Desertscrub and represents an overlap area for two desert subdivisions, namely the Arizona Upland and the Lower Colorado. The vista presented is an open, shrub-cactus plant association, with average height slightly above 6 feet. Although no wetland or aquatic systems are present, some variety is provided by desert "washes" and drainageways where vegetation is more arborescent and dense.

Plant communities on Davis-Monthan AFB generally form a spectrum from pure stands of creosotebush to diverse communities dominated by cacti, shrubs, and small trees. The most abundant cacti observed were the prickly pear, several chollas, and the barrel cactus. Shrubs observed in addition to creosotebush were desert broom, burroweed (bursage), ocotillo, and brittlebush. Small trees included foothills paloverde, blue paloverde, mesquite, cat-claw acacia, and ironwood. All of the natural areas on the base have open spaces between the perennial trees, shrubs, and cacti during much of he year. These spaces may become completely covered by annual flowering plants following rainy periods.

Abundant animal life is present in the desert-scrub community found on Davis-Monthan AFB. More than 120 bird species are present in the area, including hawks, owls, doves, quail, thrashers, wrens, roadrunners, buntings, sparrows, warblers, crows, etc. Three species of game birds are hunted on-base, i.e., the mourning dove, the white-winged dove, and Gambel's quail. Other wildlife includes large numbers of round-tailed ground squirrels,

blacktailed jackrabbits, and desert cottontail rabbits. Many reptiles, including snakes and lizards, are known to occur on the base as well as a large variety of insects. There are no fishes known to occur on-base.

2. Threatened and Endangered Species

Table 4 indicates that a large number of species presently listed or that may soon be listed, do occasionally occur in the vicinity of the base or the off-base sites (18 Titan Missile Sites and Mt. Lemmon Air Force Station). However, no evidence was found to indicate the presence of threatened or endangered (T&E) species on Davis-Monthan AFB.

3. Environmental Stress

No evidence of environmental stress resulting from past disposal of hazardous wastes was observed during the helicopter overflight and ground tours of Davis-Monthan AFB. Desertscrub vegetation recovers slowly from disturbance caused by clearing or excavation, so that past disposal and fire-training areas are clearly visible from the air. Also, zonation between pure creosotebush stands and the more diverse cactus-paloverde plant communities was observed at various points around the base. There is no reason to believe that this zonation is the result of past disposal practices.

Table 4
RARE PLANT AND ANIMAL SPECIES RESIDING OR TRANSIENT WITHIN A 50-MILE RADIUS OF DAVIS-MONTHAN AFB, PIMA COUNTY, ARIZONA

Common Name	Scientific Name	Status[a] Federal	Status[a] State	Habitat
ANIMALS				
Jaguarundi	*Felis yagouroundi*	E		Brushy Areas, Thorn Thickets
Beardless Flycatcher	*Camptostoma imberbe*		T	Dense Thickets
Black-Bellied Whistling Duck	*Dendrocygna autumnalis*		T	Occasional Migrant
Masked Bobwhite	*Colinus virginianus ridgwayi*	E	E	Brushy Areas
Mexican Duck	*Anas diazi*	E		Occasional Migrant
Peregrine Falcon	*Falco peregrinus*	E		Occasional Migrant
Southern Bald Eagle	*Haliaeetus leucocephalus*	E		Occasional Migrant
Zoned-Tailed Hawk	*Buteo albonatus*		T	Occasional Migrant
Gila Topminnow	*Poeciliopsis occidentalis*	E	T	Streams
Desert Tortoise	*Gopherus agassizi*		T	Sonoran Desertscrub
Gila Monster	*Heloderma suspectum*		T	Sonoran Desertscrub
PLANTS				
Arizona Manihot	Manihot davisiae	C1		Rocky Slopes
Beardless Chinchweed	*Pectis imberbis*	C1		Oak Woodlands
Five Scale Bitterweed	*Hymenoxys quinquesquamata*	C2		
Goodding Onion	*Allium gooddingii*	C1		Riparian
Lemmon Cloak Fern	*Notholaena lemmoni*	C2		
Needles Knotweed	*Polygonum fusiforme*	C2		Riparian
Needle Spine Pineapple Cactus	*Neolloydia erectocentra*	C1		Sonoran Desertscrub
Nichol Turks Head Cactus	*Echinocactus horizonthalonius* var. *nicholii*	E		Sonoran Desertscrub
Night-Blooming Cereus	*Peniocereus greggii*	C2		Sonoran Desertscrub
Pringle Lip Fern	*Cheilanthes pringlei*	C2		
Santa Catalina Beardtongue	*Penstemon discolor*	C1		Granite Cliffs
Stout Needle Muhly	*Coryphantha scheeri* var. *robustispina*	C1		Rocky Slopes
Thornber Fishook Cactus	Mammilaria thornberi	C1		Sonoran Desertscrub
Thurber Tithonia	*Tithonia thurberi*	C2		
Tumamoc Globeberry	*Tumamola macdougalii*	C1		Desert Washes

Table 4--continued

REFERENCE: Arizona Game and Fish Commission, 1978; USFWS, 1980.

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[a]E--"Endangered"
T--"Threatened"
C1--"Category 1"--Appropriate for listing.
C2--"Category 2"--Appropriate for listing, but additional information required.

IV. FINDINGS

A. Activity Review

1. Summary of Industrial Wastes Disposal Practices

The majority of industrial operations at Davis-Monthan AFB have been in existence since the early 1940's. Although the initial construction of the base began in 1927, major industrial activities did not begin operation until the base expanded in 1941. Therefore, the industrial operations and related wastes were comparatively small prior to 1941. The major industrial operations include propulsion shops, pneudraulic shops, aerospace ground equipment (AGE) maintenance shops, non-destructive inspection (NDI) labs, and corrosion control shops. These industrial operations generate varying quantities of waste oils, fuels, solvents, and cleaners. The total quantity of waste oils, fuels, solvents, and cleaners generated ranges from 50,000 to 75,000 gallons per year.

Standard procedures for past (based on the best recollection of interviewees) and present industrial waste disposal practices at Davis-Monthan AFB are as follows:

a. Main Base Industrial Activities

- 1941 to 1976: Industrial wastes included waste oils, fuels, solvents, paints, and paint thinners. Prior to 1946, waste oils and fuels, commingled with small quantities of waste solvents, were used in fire department training exercises. From 1946 to 1976, the majority of waste oils were collected and transported to the MASDC flush farm

waste POL storage tank, which would then be used for road oiling along MASDC tow roads. Although the principal means of waste oil disposal was road oiling in MASDC, some small quantities continued to be used in fire department training exercises. Also, some waste oils were dumped into drainage ditches or washed into the sanitary sewer system. In approximately 1970, oil/water separators were constructed to collect wastes before discharging to the sanitary sewer. The oil/water separator skimmings were collected and removed by a contractor.

Contaminated fuels were either recycled back into the fuels system or used in fire department training exercises.

Waste solvents, paints, and paint thinners were either placed in 55-gallon drums and disposed of in the main base landfill or discharged to the sanitary sewer system. Oil/water separators were connected to the sanitary sewer system in approximately 1970.

- 1976 to 1979: The disposal of waste oils by road oiling was halted in 1976. The waste oils were transported to the flush farm waste POL storage tank and removed by a contractor. The burning of contaminated fuels in fire department training exercises was stopped in 1976 and contaminated fuels were recycled. The landfilling of drummed waste

solvents, paints, and paint thinners was halted in 1976 with the closing of the main base landfill. The waste solvents, paints, and paint thinners were either collected and removed by a contractor or were collected by oil/water separators which are connected to the sanitary sewer. The oil/water separator skimmings were collected and removed by a contractor.

- 1979 to Present: Waste oils are segregated, placed in 55-gallon drums, and sent to Defense Property Disposal Office (DPDO) for sale to a contractor. Contaminated fuels were either reused or recycled depending on the level of contamination. Waste solvents, paints, and paint thinners are segregated, drummed, and turned in to DPDO for storage to await proper disposal by a contractor. Since 1981, spent solvents and other hazardous materials have been stored at the P-2 interim hazardous waste storage site awaiting contractor disposal through DPDO. In the latter part of 1982, a new hazardous waste storage facility located in the DPDO storage yard will be activated.

b. MASDC Industrial Activities

- 1946 to 1976: MASDC was activated at Davis-Monthan AFB in 1946. A detailed history of MASDC operations is given in Section A.2, Page IV-5. Waste oils were collected and transported to the MASDC

flush farm waste POL storage tank, which were then used for road oiling along MASDC tow roads. During the period from 1956 to 1960, waste oils were also dumped into a drainage ditch between Runway No. 4 and Wherry Housing.

All fuels drained from aircraft were recycled back into the fuels systems. All 10/10 oil was also recycled at the MASDC flush farm until it reached 25 percent contamination, after which it was sold to a contractor.

Waste solvents were discharged to the sanitary sewer system, and some small quantities were commingled with the waste oils and used for road oiling. Oil/water were constructed in 1970 to collect wastes before discharging to the sanitary sewer system. The oil/water separator skimmings were collected and removed by a contractor. Waste paints and paint thinners were drummed and brought to the main base landfill.

- 1976 to 1979: Waste oils were removed by a contractor after the practice of road oiling was stopped. Contaminated fuels and 10/10 oil were recycled. Waste solvents were either collected and removed by a contractor or collected by oil/water separators which are connected to the sanitary sewer. The oil/water skimmings were collected and removed by a contractor.

- 1979 to Present: Waste oils are segregated. Engine oil and non-synthetic oils are placed in the flush farm waste POL storage tank and sold to a contractor. Synthetic oils are placed in 55-gallon drums and turned in to DPDO for sale to a contractor. Waste solvents, paints, and paint thinners are segregated, drummed, and turned in to DPDO for storage to await proper disposal by a contractor.

2. Industrial Operations

The industrial operations at Davis-Monthan AFB are primarily involved in the routine maintenance OA-37B, A-10A, F-106A, EC-130H aircraft and HH-1H helicopters. The industrial activities in MASDC, which is the single largest industrial tenant on Davis-Monthan AFB, are involved in the storage, reclamation, return to flyable status, and disposition of some 70 different models of aircraft. Appendix E contains a master list of the industrial operations.

A review of base records and interviews with past and present base employees resulted in the identification of the industrial operations where the majority of industrial chemicals are handled and hazardous wastes are generated. Table 5 summarizes the major industrial operations and includes the estimated quantities of wastes generated as well as the past and present disposal practices of these wastes, i.e., treatment, storage, and disposal. Information on estimated waste quantities and past disposal practices is based upon information obtained from shop files and interviews with shop personnel based upon their best recollection. Descriptions of the major industrial activities are included in the following paragraphs.

Table 5
MAJOR INDUSTRIAL OPERATIONS SUMMARY

Shop Name	Location (Bldg. No.)	Waste Material	Estimated Waste Quantity	Treatment/Storage/Disposal Methods 1940 1950 1960 1970 1980
MASDC				
Powered AGE Maintenance Shop	7222	Hydraulic Oil Engine Oil	100 gal/yr 750 gal/yr	Road Oiling[a]; Contractor Removal; DPDO[b]
		PD 680	50 gal/yr	Sanitary Sewer[c]; Contractor Removal; DPDO[b]
		Battery Acid	400 gal/yr	Neutralization to Sanitary Sewer
Corrosion Control Shop	7425	PD 680	4,150 gal/yr	Evaporation, Sanitary Sewer; Evaporation, Oil/Water Separator to Sanitary Sewer
		Alkaline Cleaning Compound Cleaning Solvent PC-444 Paint Remover Sodium Bicarbonate Ammonium Hydroxide	5,200 gal/yr 1,820 gal/yr 82 gal/yr 41 lb/yr 7 gal/yr	Sanitary Sewer; Oil/Water Separator to Sanitary Sewer
Propulsion Shop	7300 7301 7340	Hydraulic Oil	100 gal/yr	Road Oiling[a]; Contractor Removal; DPDO
		Engine Oil 10/10 Oil PD 680 (Commingled)	800 gal/yr	
NDI Lab	7401	Penetrant Developer Fixer	2 gal/yr 240 gal/yr 275 gal/yr	Silver Recovery, Sanitary Sewer[c]
		Kerosene	100 gal/yr	Sanitary Sewer[c]; DPDO[b]
Pneudraulics	7415	Hydraulic Fluid Cleaning Solvent Motor Oil (Commingled)	200 gal/yr	Road Oiling[a]; Contractor Removal; DPDO
Preservation Section (Flush Farm)	7448	Hydraulic Fluid Engine Oil	2,000 gal/yr 10,000 gal/yr	Road Oiling[a]; Contractor Removal; DPDO[b]
		10/10 Oil	29,000 gallons On Hand	Recycled[d]
		Residual Fuel	10,000 gal/yr	Recycled
Reclamation Shop (Parts Removal)	7401	10/10 Oil	2,000 gal/yr	Road Oiling; Contractor Removal; DPDO
Small Parts Cleaning Shop	7401	PD 680 Paint Remover Corrosion Remover	200 gal/yr 10 gal/yr 10 gal/yr	Sanitary Sewer[c]
		Carbon Remover	600 gal/yr	Evaporation, Sanitary Sewer[c]

Table 5 – Continued

Shop Name	Location (Bldg. No.)	Waste Material	Estimated Waste Quantity	Treatment/Storage/Disposal Methods 1940 1950 1960 1970 1980
836th Transportation Squadron				
General Purpose Vehicle Maintenance Shop	4705	Waste Oil Waste Diesel Fuel	2,400 gal/yr 50 gal/yr	Road Oiling[e] → Contractor Removal → DPDO[f]
		PD 680	150 gal/yr	Landfill, Sanitary Sewer[c] → Contractor Removal → DPDO[f]
390th MIMS				
Pneudraulics Shop	1540	Hydraulic Fluid	1,200 gal/yr	Road Oiling[e] → Contractor Removal → DPDO[f]
		PD 680 Freon (Commingled)	120 gal/yr	Landfill, Sanitary Sewer[c] → Contractor Removal → DPDO[f]
Propulsion	1540	Engine Oil	100 gal/yr	Road Oiling[e] → Contractor Removal → DPDO[f]
		Methanol Freon	100 gal/yr 110 gal/yr	Landfill, Sanitary Sewer[c] → Contractor Removal → DPDO[f]
		PD 680 MEK	Consumed in Use Consumed in Use	
Final Clean Shop	1540	10% Triethanolamine 10% Hydroxyacetic Acid	100 gal/yr 100 gal/yr	Neutralization to Sanitary Sewer
Power Production Shop	1540	Lube Oil	1,200 gal/yr	Road Oiling[e] → Contractor Removal → DPDO[f]
23rd TASS				
AGE Maintenance Shop	1358	Engine Oil Hydraulic Fluid	300 gal/yr 60 gal/yr	Road Oiling[e] → Contractor Removal → DPDO[f]
Corrosion Control	1447	Paint Thinner Paint Residue PD 680 (Commingled)	100 gal/yr	Landfill, Sanitary Sewer[c] → Contractor Removal → DPDO[f]
		PD 680 MEK Paint Stripper	500 gal/yr 240 gal/yr 110 gal/yr	Oil/Water Separator to Sanitary Sewer
356th CRS				
Battery Shop	5045	Battery Acid	360 gal/yr	Neutralization to Sanitary Sewer
NDI Lab	5406	Penetrant	110 gal/yr	Landfill, Sanitary Sewer[c] → Contractor Removal → DPDO[f]
		Waste Oil	90 gal/yr	Road Oiling[e] → Contractor Removal → DPDO[f]
Engine Shop	5245	Engine Oil Hydraulic Fluid	300 gal/yr 25 gal/yr	Road Oiling[e] → Contractor Removal → DPDO[f]
Non-Powered AGE Maintenance Shop	5245	1,1,1-Trichloroethane PD 680 Carbon Remover	50 gal/yr 50 gal/yr 50 gal/yr	Landfill, Sanitary Sewer[c] → Contractor Removal → DPDO[f]
		Engine Oil	50 gal/yr	Road Oiling[e] → Contractor Removal → DPDO[f]

Table 5—Continued

Shop Name	Location (Bldg. No.)	Waste Material	Estimated Waste Quantity	Treatment/Storage/Disposal Methods 1940 1950 1960 1970 1980
365th EMS				
AGE Maintenance Shop	4712	PD 680	50 gal/yr	Landfill, Sanitary Sewer[c]; Contractor Removal; DPDO[f]
		Hydraulic Fluid Turbine Oil General Purpose Oil	200 gal/yr 200 gal/yr 225 gal/yr	Road Oiling[e]; Contractor Removal; DPDO[f]
Armament Shop	4810	PD 680 1,1,1-Trichloroethane	2,400 gal/yr 100 gal/yr	Landfill, Sanitary Sewer[c]; Contractor Removal; DPDO[f]
Corrosion Control Shop	5250	Aircraft Cleaning Compound Lacquer Thinner	2,640 gal/yr 500 gal/yr	Oil/Water Separator to Sanitary Sewer
		B&B Chemical 20/20 MEK Epoxy Stripper Commingled	850 gal/yr	Landfill, Sanitary Sewer[c]; Contractor Removal; DPDO[f]

[a]During the period between 1956 and 1960, waste oils from MASDC were dumped into a drainage ditch between Runway No. 4 and Wherrying Housing.

[b]MASDC waste oils are segregated; engine oil is transported to the flush farm waste POL storage tank, which is pumped out by a contractor; synthetic oils are drummed and turned in to DPDO for sale to a contractor.

[c]Oil/water separators were connected to the sanitary sewer in approximately 1970 to collect wastes.

[d]10/10 oil is recycled until it reaches 25 percent contamination, then it is recycled offsite by a contractor.

[e]The primary means of waste oil disposal was road oiling on MASDC tow roads; other methods included burning during fire department training exercises, dumping into drainage ditches, and discharging to the sanitary sewer system (see footnote c).

[f]Wastes are segregated and turned in to DPDO for sale to a contractor or contractor removal.

a. MASDC

MASDC began operations at Davis-Monthan AFB in 1946 and remains today the single operating agency of the USAF which conducts storage, reclamation, and disposal operations for all aircraft not immediately required in the operational inventory of the Department of Defense. MASDC industrial activities were originally conducted in the Runway No. 4 area from approximately 1946 to 1968. During this period the aircraft were serviced for storage only. In 1960, MASDC operations expanded to include the North Ramp and Chevron areas of the base. Although a washrack and flush farm were located in the North Ramp area, the industrial shops remained in their original location in the Runway No. 4 area. In 1968 the industrial shops were relocated to their current location. In addition to the relocation, the operation was expanded to include aircraft parts salvage, which has become an important part of the MASDC mission.

i) Powered AGE Maintenance Shop

The Powered AGE Maintenance Shop is located in Facility 7222 and has been at this location since 1971. Prior to 1971, the shop was located in the Runway No. 4 area. The responsibility of the shop is to repair, maintain, and periodically inspect all powered aerospace ground equipment. Wastes generated include hydraulic oil (100 gal/yr), engine oil (750 gal/yr), PD 680 (50 gal/yr), and battery acid (400 gal/yr). PD 680 is a petroleum distillate used as a safety cleaning solvent. PD 680 Type II is currently used in the industrial operations at Davis-Monthan AFB; however, PD 680 Type I and Type II were commonly used in the past. The final disposition of the hydraulic oil and engine oil has been road oiling in MASDC from 1946 to 1976 and contractor removal from 1976 to 1979. From 1979 to present, the hydraulic oil has been placed in

55-gallon drums and turned in to DPDO for sale to a contractor, and the engine oil is transported to the flush farm waste POL storage tank for contractor removal. The final disposition of the PD 680 has been discharge to the sanitary sewer from 1946 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for contractor removal from 1979 to present. The waste battery acid was neutralized by placing the batteries in a tank of sodium bicarbonate, which was periodically poured into the sanitary sewer. The shop stopped servicing batteries in 1978.

ii) Corrosion Control Shop

The Corrosion Control Shop is located in Facility 7425 and has been at this location since 1970. From 1946 to 1970, the shop was located in the Runway No. 4 area. All the corrosion control activities, which include cleaning, sanding, wiping, priming, and limited painting of aircraft, are conducted on the outdoor washrack apron. The wash water from the corrosion control washrack (approximately 10,000 gpd) goes to an oil/water separator. Materials used include PD 680 (4,150 gal/yr), alkaline cleaning compound (5,200 gal/yr), aliphatic naphtha (58 gal/yr), paint remover (82 gal/yr), methyl ethyl ketone (MEK) (41 gal/yr), potassium dichromate (8 lb/yr), zinc chromate (13 gal/yr), aluminum brightener (39 gal/yr), sodium bicarbonate (41 lb/year), and ammonium hydroxide (7 gal/year). Aluminum brightener contains 6 percent MEK and 18 percent phosphoric acid. Most of the PD 680, alkaline cleaning compound, paint remover, sodium bicarbonate, and ammonium hydroxide are discharged with the wash water. Most of the remaining materials are consumed in use or evaporated.

iii) Propulsion Shop

The Propulsion Shop is located in Facilities 7300, 7301, and 7340 and has been at these

locations since 1968. Prior to 1968, the shop was located in the Runway No. 4 area. Wastes generated include hydraulic oil (100 gal/yr) and commingled engine oil, 10/10 oil, and PD 680 (800 gal/yr). The final disposition of these wastes has been road oiling from 1946 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for sale to a contractor from 1979 to present.

iv) NDI Lab

The NDI Lab is located in Facility 7401 and has been at this location since 1968. From 1946 to 1968, the NDI Lab was located in the Runway No. 4 area. Non-destructive testing methods, including x-ray, magna flux, and ultra sound, are performed to determine material defects of aircraft structures and component parts. Wastes generated include penetrant (2 gal/yr), developer (240 gal/yr), and fixer (275 gal/yr). After silver recovery, the penetrant, developer, and fixer solutions are discharged to an oil/water separator built in 1970. From 1946 to 1979, the waste kerosene was also discharged to the sanitary sewer and from 1979 to present, the kerosene has been turned in to DPDO for contractor removal.

v) Pneudraulics Shop

The Pneudraulics Shop is located in Facility 7415 and has been at this location since 1968. Prior to 1968, the shop was located in the Runway No. 4 area. The primary purpose of this shop is to service and repair all aircraft penumatic and hydraulic equipment. Wastes generated include commingled hydraulic fluid, cleaning solvent, and motor oil (200 gal/yr). The final disposition of these wastes has been road oiling from 1946 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for contractor removal from 1979 to present.

vi) Preservation Section (Flush Farm)

The flush farm activities are conducted outdoors on the aircraft parking apron located adjacent to Facilities 7446, 7447, and 7448. The flush farm has been at this location since 1968. Prior to 1968 the flush farm was located in the Runway No. 4 area and in the North Ramp area. The preservation process conducted at the flush farm includes the following: (1) the fuel from the aircraft is drained into a fuel tanker truck, (2) any residual fuel remaining after the defueling operation is drained into a bowser, (3) the fuel system is pumped full of lightweight 10/10 oil and drained again, leaving a film of oil to preserve the fuel system, and (4) the aircraft hydraulics and tires are serviced to normal standards. Wastes generated include hydraulic fluid (2,000 gal/yr) and engine oil (10,000 gal/yr). The final disposition of these wastes has been road oiling from 1946 to 1976 and contractor removal from 1976 to 1979. From 1979 to present, the hydraulic fluid is placed in 55-gallon drums and turned in to DPDO for sale to a contractor, and the engine oil is drained into the flush farm waste POL storage tank for contractor removal. The 10/10 (29,000 gallons on hand) is recycled until it reaches 25 percent contamination; it is then sold to a contractor. Since 1976 the 10/10 oil has been recycled through a filter system. Prior to the installation of the filter system, the 10/10 oil was stored in tanks and aerated to remove impurities. The JP-4 fuel (estimated 100,000 gal/yr) generated during the defueling operation is recycled back into the main base fuel system. The residual fuel (10,000 gal/yr) is stored in a fuel storage tank at the flush farm, tested when full, and if not contaminated it is also recycled back into the main base fuel system.

vii) Reclamation Shop (Parts Removal)

The Reclamation Shop is located in Facility 7401 and has been at this location since the shop was activated in 1968. The activities conducted in the Reclamation Shop are involved with the removal and salvage of various aircraft parts. The only waste generated is 10/10 oil (2,000 gal/yr). The final disposition of the 10/10 oil was road oiling from 1968 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for sale to a contractor from 1979 to present.

viii) Small Parts Cleaning Shop

The Small Parts Cleaning Shop is located in Facility 7401 and has been at this location since the shop was activated in 1968. Small aircraft parts are cleaned and rinsed in a series of large dip tanks at the shop. In addition to the dip tanks, which contain carbon remover, the shop also utilizes a vapor degreaser tank which contains 1, 1, 1- trichloroethane. Wastes generated include PD 680 (200 gal/yr), paint remover (10 gal/yr), corrosion remover (10 gal/yr), and carbon remover (600 gal/yr). The corrosion remover consists of phosphoric acid, and the carbon remover consists of 10 percent butyl cellosolve, 20 percent monoethanol amine, and ethylene glycol ether. The final disposition of the PD 680, paint remover, corrosion remover, and carbon remover has been discharge to an oil/water separator. Some evaporation of the PD 680 and carbon remover takes place during the cleaning operation. Since the vapor degreaser tank has not required cleaning in recent years, no waste 1, 1, 1- trichloroethane has been generated. Prior to 1975, trichlorethylene (TCE) was used in the vapor degreaser tank. Small quantities of waste sludge containing TCE may have been generated in the past. The disposition of this sludge was probably to the MASDC flush farm waste POL storage tank.

b. 836th Transportation Squadron

The General Purpose Vehicle Maintenance Shop is located in Facility 4705 and has been at this location since 1953. Routine minor maintenance and major overhaul, including oil change and body work, of gasoline-powered vehicles is performed. Wastes generated include waste oil (2,400 gal/yr), waste diesel fuel (50 gal/yr), and PD 680 (150 gal/yr). The final disposition of the waste oil and diesel fuel has been road oiling from 1953 to 1976, contractor removal from 1976 to 1979, and forwarding to DPDO for sale to a contractor from 1979 to present. The final disposition of the PD 680 has been landfill or discharge to the sanitary sewer from 1953 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for contractor removal from 1979 to present.

c. 390th Missile Maintenance Squadron (MIMS)

i) Pneudraulics Shop

The Pneudraulics Shop is located in Facility 1540 and has been at this location since 1960. Wastes generated include hydraulic fluid (1,200 gal/yr), and commingled PD 680 and Freon (120 gal/yr). The final disposition of the hydraulic fluid has been road oiling from 1960 to 1976, contractor removal from 1976 to 1979, and forwarding to DPDO for sale to a contractor from 1979 to present. The final disposition of the commingled PD 680 and Freon has been landfill or discharge to the sanitary sewer from 1960 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO from 1979 to present.

ii) Propulsion Shop

The Propulsion Shop is located in Facility 1540 and has been at this location since 1960. The majority of the Propulsion Shop activities are conducted at the individual Titan Missile Sites, and waste materials are brought back to the main base for final disposition. The engine oil in the missiles is changed twice per year, generating waste engine oil. Other wastes include Freon and methanol, which are used for leak testing. Waste quantities generated include engine oil (100 gal/yr) and methanol (100 gal/yr). MEK and PD 680 are also used, but are consumed in use. The final disposition of the engine oil has been road oiling from 1960 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for sale to contractor from 1979 to present. The final disposition of the methanol and Freon has been landfill or discharge to the sanitary sewer from 1960 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for contractor removal from 1979 to present.

iii) Final Clean Shop

The Final Clean Shop is located in Facility 1540 and has been at this location since 1960. The decontamination and cleaning of parts which have been in contact with Aerozine 50 rocket fuel (a one-to-one mixture of hydrazine and unsymmetrical dimethyl hydrazine) or oxidizer (nitrogen tetroxide) is conducted in the shop. The parts are decontaminated in two approximately 100-gallon dip tanks. One contains 10 percent triethanolamine used as the decontaminating agent for the oxidizer, and the other contains 10 percent hydroxyacetic acid used as the decontaminating agent for the Aerozine 50. Wastes generated include 10 percent triethanolamine (100 gal/yr) and 10 percent hydroxyacetic acid (100 gal/yr). The dip tanks are cleaned approximately once per year and are drained to

two underground tanks located outside and to the east of Facility 1540. A total of three underground tanks are used by the 390th MIMS for waste material storage. Two of the tanks have a capacity of 15,000 gallons and the third has a capacity of 3,500 gallons. The 3,500-gallon tank is located to the north of Facility 1540. All three tanks are connected in series to facilitate pumping out the waste material. These tanks also receive washwater originating from other maintenance activities conducted inside the hanger, such that the concentration of the triethanolamine or the hydroxyacetic acid is less than 10 percent. The waste material in the tanks is tested by Bioenvironmental Engineering, and the correct neutralization procedures are determined. The waste material is then neutralized, pumped into a truck, and then discharged into the sanitary sewer.

iv) Power Production Shop

The Power Production Shop is located in Facility 1540 and has been at this location since 1960. The only waste material generated in the shop is lube oil (1,120 gal/yr). The final disposition of the lube oil has been road oiling from 1960 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for sale to a contractor form 1979 to present.

d. <u>23rd Tactical Air Support Squadron (TASS)</u>

i) AGE Maintenance Shop

The AGE Maintenance Shop is located in Facility 1358 and has been at this location since 1980. From 1970 to 1980 the shop was located in Facility 1447. Wastes generated include engine oil (300 gal/yr) and hydraulic fluid (60 gal/yr). The final disposition of the above wastes has been road oiling from 1970 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO from 1979 to present.

ii) Corrosion Control Shop

The Corrosion Control Shop is located in Facility 1447 and has been at this location since 1970. All corrosion control activities are conducted on the outdoor washrack apron located adjacent to Facility 1477. Wastes generated include commingled paint thinner, paint residue, and PD 680 (600 gal/yr); MEK (240 gal/yr); and paint stripper (110 gal/yr). The final disposition of the commingled paint thinner, paint residue, and PD 680 which is generated in small touch-up painting operations has been landfill or discharge to the sanitary sewer from 1970 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO from 1979 to present. The PD 680, MEK, and paint stripper used on the washrack are discharged to an oil/water separator.

e. <u>355th Component Repair Squadron (CRS)</u>

i) Battery Shop

The Battery Shop is located in Facility 5045 and has been at this location since 1960. Wastes generated from the servicing of both lead and nickel-cadmium batteries consist primarily of waste battery acid and waste battery electrolyte (360 gal/yr). The lead batteries are neutralized with sodium bicarbonate, and the nickel-cadmium batteries are neutralized with boric acid. The neutralized battery acid and battery electrolyte are discharged to the sanitary sewer.

ii) NDI Lab

The NDI Lab is located in Facility 3406 and has been at this location since 1971. Wastes generated include penetrant (110 gal/yr) and waste oil (90 gal/yr). The final disposition of the penetrant has been landfill or

discharge to the sanitary sewer from 1971 to 1976, contractor removal from 1976 to 1979, and forwarding to DPDO from 1979 to present. The final disposition of the engine oil has been road oiling from 1971 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO from 1979 to present.

iii) Engine Shop

The Engine Shop is located in Facility 5245 and has been at this location since 1970. Wastes generated during the maintenance of aircraft engines include engine oil (300 gal/yr) and hydraulic fluid (25 gal/yr). The final disposition of these wastes has been road oiling from 1970 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for sale to a contractor from 1979 to present.

iv) Non-Powered AGE Maintenance Shop

The Non-Powered AGE Maintenance Shop is located in Facility 5245 and has been at this location since 1970. Wastes generated include 1, 1, 1- trichlorethane (50 gal/yr), PD 680 (50 gal/yr), carbon remover (50 gal/yr), and engine oil (50 gal/yr). The final disposition of the 1, 1, 1- trichloroethane, PD 680, and carbon remover has been landfill or discharge to the sanitary sewer from 1970 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for contractor removal from 1979 to present. The final disposition of the engine oil has been road oiling from 1970 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for sale to a contractor from 1979 to present.

f. 355th Equipment Maintenance Squadron (EMS)

i) AGE Maintenance Shop

The AGE Maintenance Shop is located in Facility 4712 and has been at this location since 1970. Wastes generated include PD 680 (50 gal/yr) and general purpose oil (225 gal/yr). The final disposition of the PD 680 has been landfill or discharge to the sanitary sewer from 1970 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for contractor removal from 1979 to present. The final disposition of the hydraulic fluid, turbine oil, and general purpose oil has been road oiling from 1970 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for sale to a contractor from 1979 to present.

ii) Armament Shop

The Armament Shop is located in Facility 4810 and has been at this location since 1970. Wastes generated from the cleaning of armaments include PD 680 (2,400 gal/yr) and 1, 1, 1- trichloroethane (100 gal/yr). The dip tanks containing PD 680 are cleaned approximately every 2 weeks and the vapor degreaser tank containing 1, 1, 1- trichloroethane is cleaned every 6 months. The final disposition of these wastes has been landfill or discharge to the sanitary sewer from 1970 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for contractor removal from 1979 to present.

iii) Corrosion Control Shop

The Corrosion Control Shop is located in Facility 5250 and has been at this location since 1956. The corrosion control activities are conducted on the washrack (Facility 5241) located adjacent to Facility 5250. Wastes

generated include aircraft cleaning compound (2,640 gal/yr), lacquer thinner (500 gal/yr), and commingled B&B chemical 20/20 (a petroleum solvent used as an aircraft cleaning compound), MEK, and epoxy stripper (850 gal/yr). The aircraft cleaning compound and lacquer thinner are discharged to an oil/water separator which was constructed in 1954. The final disposition of the commingled B&B chemical 20/20, MEK, and epoxy stripper has been landfill or discharge to the sanitary sewer from 1956 to 1976, contractor removal from 1976 to 1979, and conveyance to DPDO for contractor removal from 1979 to present.

3. Fuels

The major fuel storage area at Davis-Monthan AFB is located at Facility 115, the bulk POL storage area. The bulk storage area houses five aboveground diked POL storage tanks. Three of the storage tanks contain JP-4 and have a capacity of 2,847,500 gallons per tank. The other two tanks, which are currently empty but were used for AVGAS storage in the past, have a capacity of 2,295,000 gallons per tank. The other major fuel storage areas are the J-3 and A-2 pumphouses. The J-3 pumphouse contains nine underground tanks with a capacity of 40,000 gallons per tank which are used for JP-4 storage. The A-2 pumphouse contains one 50,000-gallon and four 40,000-gallon underground tanks. Two of the 40,000-gallon tanks store AVGAS, the other two store MOGAS, and the 50,000-gallon tank stores diesel fuel. A complete inventory of POL storage tanks, including location, capacity, and type of POL stored, is included in Appendix F.

The records search did not indicate any problems with leaky tanks, major fuel spills, or suspected fuel-saturated areas. All of the active underground storage tanks are leak-tested annually.

The major POL storage tanks are cleaned about once every 8 years. The quantities of sludge generated during a cleaning operation are small, approximately 200 gallons per cleaning operation. The long period between cleaning operations and the small quantities of sludge produced can be attributed to the low humidity, which allows very little condensation to occur. The sludge, which consists mainly of water, rust, dirt, and fuel, is weathered for 2 to 4 weeks and buried in shallow trenches. The sludge was analyzed and determined not to be a hazardous waste. Until recently the sludge has been weathered and buried inside the diked area at the bulk POL storage area. The current site for weathering of small quantities of fuel tank sludge is located to the east of the J-1 pumphouse. Since leaded AVGAS was used at Davis-Monthan AFB in the past, some lead residue may have been present in the sludge buried at the bulk POL storage area.

4. Deactivated Tanks

There are 35 known deactivated storage tanks located on Davis-Monthan AFB. The location, capacity, and type of POL which was stored in these tanks are summarized in Appendix G. These tanks are "pickled" and contain a mixture of caustic soda and water. The level of the caustic soda solution in the deactivated tanks is checked annually.

5. Fire Department Training Activities

Fire department training activities have been common since the activation of the base. Past and present fire department training activities at Davis-Monthan AFB are as follows:

- Early 1940's to 1950: During this time period training exercises were conducted at the Abandoned Fire Department Training Area

(Site No. 5), which was located between Wherry Housing and the Officers' Club. Information about this site is limited. Exercises were conducted about once per week using 200 gallons of POL waste per exercise. The POL waste included commingled waste oils, fuels, and solvents. The POL waste was poured onto a simulated aircraft and set on fire. Most of the POL waste would have been consumed in the fire, but some minor infiltration into the ground may have taken place.

- 1950 to 1968: During this time period training exercises were conducted at the North Ramp Fire Department Training Area (Site No. 4). This site was located in the North Ramp area of the base and is still visible today as a circular bermed-in area. Exercises were conducted about once per week using 200 gallons of POL waste, mainly waste fuels, per exercise. The same procedure used at the previous site were followed, and some minor percolation into the ground may have occurred within the bermed area.

- 1968 to Present: Exercises are currently conducted at the Existing Fire Department Training Area (Site No. 3). From 1968 to 1972, the exercises were conducted once per week using 200 gallons of POL waste, mainly waste fuels, per exercise. After 1972, the frequency of training exercises was reduced to once per month using 200 gallons of POL waste per exercise. In 1976, clean JP-4 was substituted for POL waste as the starter fuel. From 1976 to present, the exercises

have been conducted once per month using 200 gallons of JP-4 per exercise. The same procedures used at the previous sites were followed. The site contains three training areas located within separate earthen berms. One area contains an old POL storage tank, and another area contains the burned shell of an aircraft which is currently being used for the exercises. The third bermed-in area was recently constructed and contains an out-of-service aircraft to be used for future exercises. The site also includes the shell of a cinder block building and a wrecked vehicle which are also used for training exercises. Two 1,000-gallon above ground storage tanks for JP-4 are located on the site, and a minor leak was observed in one of the tanks (reported to the base environmental coordinator). As with the previous sites, some minor percolation of fuels into the ground may have taken place within the earthen berms.

6. Polychlorinated Biphenyls (PCBs)

Polychorinated biphenyls (PCBs) are among the most chemically and thermally stable organic compounds known to man. Because of their stability, PCBs, once introduced into the environment, persist for long periods of time and are not readily biodegradable. The current established PCBs criteria are as follows:

PCBs Concentration (ppm)	Classification
Less than 50	Non-regulated
Between 50 and 500	PCBs-contaminated
Greater than 500	PCBs

Possible sources of PCBs at Davis-Monthan AFB are electrical transformers and capacitors. There are 608 in-service transformers on Davis-Monthan AFB. Of the 608 in-service transformers, 60 have been tested for PCBs and none were found to contain greater than 500 ppm of PCBs, 5 contain between 50 and 500 ppm of PCBs, and 55 contain less than 50 ppm of PCBs. There are 17 out-of-service transformers, all of which have been tested and are stored at the P-2 interim hazardous waste storage site. Of the 17 out-of-service transformers, none contain greater than 500 ppm of PCBs, and 16 contain less than 50 ppm of PCBs. There are 25 transformers located in the communication vans which are stored in-service at DPDO. All 25 transformers were tested and contained 500,000 ppm of PCBs. These transformers were drained early in 1982 into recovery drums for proper storage and disposal. The drums containing PCBs, approximately 60 in number, will be stored in the new hazardous waste storage facility located in DPDO to await proper contractor disposal.

There are 45 in-service capacitors at Davis-Monthan AFB and 54 more capacitors located at the Titan Missile Sites (three capacitors at each of the 18 sites). The capacitors are presumed to contain greater than 50 ppm of PCBs based on presumptive tests conducted on a few of the transformers. The presumptive test is a qualititive flame test and does not absolutely confirm the presence of PCBs.

The locations of three areas where transformer oil spills have occurred in the past were determined during the records search. It is not known if the transformer oil contained PCBs, but PCBs should be suspect at the locations. According to one interviewee (unconfirmed) approximately 10,000 gallons of transformer oil was spilled on the ground when the lightning strike destroyed four large transformers at the old electrical substation (Site No. 7) in 1964. Another interviewee (unconfirmed) reported that approximately 100 to 500 gallons of transformer oil was dumped onto the ground behind Building 4852 (Site No. 8) in 1978. An unknown quantity of transformer oil was dumped onto the ground in an area adjacent to the Civil Engineering Storage Yard (Site No. 9) in the past. Recent soil samples collected from the area adjacent to the Civil Engineering Storage Yard showed either no PCBs or very low PCB levels (less than 2 ppm). No soil sampling has been conducted at the other locations.

7. Pesticides

Pesticides are commonly used at Davis-Monthan AFB for weed and pest control. The Entomology Shop controls the use and handling of all the pesticides used to control mosquitos, fleas, cockroaches, ants, ticks, termites, and rats, as well as undesirable weeds and overgrowth.

The major pesticides currently used are: Strychnine (2 lb/mo), Warfarin Anticoagulant (5 lb/mo), Chlordane (15 gal/mo), Diazinon Dust (25 lb/mo), and Malathion (5 gal/mo). The major herbicides currently used on-base are: Simazine (85 lb/mo), Bromacil (200 lb/mo), Round-Up (3 gal/mo), and Duncmherb (20 lb/mo). Proper preparation and application procedures are followed. All empty pesticide containers are triple-rinsed and punctured prior to disposal. Currently, all rinsed empty containers

are placed in a dumpster for contractor removal. The rinse water is used to make the next batch of pesticide.

There were no reports of banned or restricted herbicides or pesticides currently used on-base. Both DDT and 2,4-D have been used in small quantities in the past. Agent Blue, a herbicide containing cacodylic acid and arsenic, was also used in the past for weed control along the MASDC fenceline. DDT, 2,4-D, and Agent Blue are no longer used at Davis-Monthan AFB.

The quantities of waste pesticides resulting from rinsing of empty containers and application equipment from past operations are judged to be small. The records search did not indicate any apparent contamination problems from past pesticide usage.

8. Wastewater Treatment

The sanitary and industrial wastewaters from Davis-Monthan AFB are collected by two major collection systems which are tied in to the Pima County Sanitary District System by two 15-inch outfall sewer lines located in the northwest corner of the base. The sewage is treated by the Pima County under Contract FO2601-67-C-0176, which covers all sewerage service, at no cost, through the year 2012. A study of Davis-Monthan AFB's sanitary sewerage system conducted in 1971 indicated an average daily flow of 0.5 mgd and a maximum daily flow of 0.94 mgd. The flow data includes both residential and industrial sources as well as a portion of the flow attributed to the City of Tucson sewage which passes through the base.

Raw sanitary sewage analyses are conducted at least annually on samples collected from manhole No. 120. In the past, five locations were sampled (manholes No. 120, 123, 221, 298, and 314). The samples were analyzed in the

past for 54 parameters including COD, TOC, oils and grease, cyanide, TCE, 16 heavy metals, radioactivity, and other conventional parameters. A complete list of the parameters for which the wastewater was analyzed appears in Appendix H. The most recent results do not show the presence of significant concentrations of any of the parameters.

On March 15, 1982, the Pima County Phase I Industrial Wastewater Discharge Permit (Permit No. 109) became effective. The permit requires the monitoring of pH, radioactivity, oil and grease, arsenic, barium, total cadmium, total chromium, lead, mercury, selenium, and silver. Preliminary testing indicates that all parameters are within acceptable limits.

There are 20 oil/water separators located at various industrial shops and washracks to provide pretreatment of the industrial wastewater prior to discharging to the sanitary sewer. Two types of separators are employed: those which utilize flotation and those which supplement flotation with aeration and chemical addition. An inventory of all oil/water separators is provided in Appendix I. The majority of the oil/water separators were constructed around 1970. Until recently the slop oil removed by the oil/water separators was pumped out of the individual facilities by a contractor. Since 1981, the slop oil has been pumped out by Civil Engineering and stored in the 50,000-gallon J-3 pumphouse tank No. 10. The slop storage tank was analyzed and found to contain primarily water with a floating layer of oil. The layer of oil consisted primarily of synthetic and petroleum-based oil similar to engine oil and small amounts of aliphatic petroleum distillate similar to PD 680. This material is classified as a hazardous waste due to its ignitability and is awaiting sale to a contractor for reuse and recycle. In addition to the 20 oil/water separators, there are numerous

other oil and grease traps located at various sites on Davis-Monthan AFB.

9. Available Water Quality Data

The majority of the potable water for Davis-Monthan AFB is obtained from eight wells located on base property. One base facility, the 83rd Tactical Control Flight (Facility 8030), receives its drinking water from the City of Tucson's water distribution system. A summary of the eight water supply wells on Davis-Monthan AFB is given in Table 6. The average annual water demand is approximately 2.1 mgd. The location of the wells is shown on Figure 10. Six of the wells receive treatment by chlorination, and fluoridation is provided for on-base family housing.

Drinking water monitoring is routinely done by Bioenvironmental Engineering personnel. Chlorine residual, pH, and bacteriological analyses are conducted weekly. The wells are also analyzed periodically for heavy metals, pesticides, radiological parameters, and TCE. Results from the most recent analyses (February, 1981) show that no heavy metals (above primary drinking water standards), pesticides, radiation, or TCE are present in the well supplies. A complete list of the parameters for which the water supply system was analyzed appears in Appendix H.

The storm drainage system at Davis-Monthan AFB is composed primarily of ditches, dikes, and culverts. The only areas of the base having underground storm drains are the parking apron and runway. Monitoring of the surface streams is not required, because the base streams do not flow continuously; significant flows occur only during and after periods of heavy rainfall.

Table 6
ACTIVE WATER SUPPLY WELLS AT DAVIS-MONTHAN AFB[a]

Well No.	Date Installed	Diameter (in.)	Maximum Rated Flow (gpm)	Well Depth (ft.)	Surface Elevation (ft.-msl)	Perforated Intervals (ft.-bls)	Original Static Water Level (ft.-bls)	1982 Static Water Level
2	1941	16	600	405	2,650	235-392	200	303
4	1951	16	750	492	2,717	219-273	244	320
5	1952	16	750	424	2,716	250-420	238	315
6	1961	14	500	600	2,663	240-490	238	311
8	1951	10	6	526	2,899	344-424	324	350
9	1969	16	650	750	2,684	340-685 739-744	283	321
10	1971	16	1,400	1,012	2,792	215-295 310-630 785-1000	290	331
11	1971	16	1,500	1,010	2,709	318-492 530-580 645-705 740-930 960-1002	291	337

[a] All well casings are 16-inch steel with machine-drilled screens.

10. Other Activities

The review of the records and information obtained during the interviews produced no evidence of the past or present storage, disposal, or handling of biological or chemical warfare agents at Davis-Monthan AFB.

All explosive ordnance disposal activities are conducted at the ammunition detonation area (Site No. 12) located in the southeastern section of the base. This site has been in operation since approximately 1969. Prior to 1969, two old explosive ordnance disposal areas (Sites No. 13 and 14) were used. Primarily small munitions and starter cartridges are burned at the facility. The inert residue is then buried at the site. There is a 100-pound explosive limit, and any larger munitions are sent off-base for proper disposal.

There are two incinerators on Davis-Monthan AFB. The classified waste incinerator operates three days per week and incinerates about 500 lb. of material per day of operation. The pathological incinerator operates approximately twice per month and incinerates about 5 lb. of material per day of operation.

The records search indicated that TCE has been used at Davis-Monthan AFB, that small quantities are still in use today, but that no large-scale use of TCE has occurred in the past. The largest quantities of TCE were used during the period from the late 1950's to approximately 1975. Even during this period the estimated usage of TCE was only about ten 55-gallon drums per year. In approximately 1975, 1, 1, 1- trichloroethane and trichlorofluoromethane were substituted for TCE. Some small quantities (less than 2 drums per year) have recently been used in the Environmental Systems Shop and the Liquid Fuels

Management Shop. However, the Liquid Fuels Management Shop discontinued its use of TCE in early 1982.

B. Disposal Sites Identification and Evaluation

Interviews with 50 past and present base personnel (Appendix C) resulted in the identification of 34 disposal and spill sites at Davis-Monthan AFB. The approximate locations of these sites are shown on Figure 16. A summary of the approximate dates that the major sites were in use is given on Figure 17.

A preliminary screening was performed on all 34 identified past disposal and spill sites based on the information obtained from the interviews and available records from the base and outside agencies. Using the decision tree process described in Section I.E., page I-5, based on all of the above information, a determination was made whether a potential exists for hazardous material contamination in any of the identified sites. For those sites where the potential for hazardous material contamination was identified, a determination was made as to whether a potential exists for contaminant migration from these sites. The sites where the potential for migration exists were then rated using the U.S. Air Force Hazard Assessment Rating Methodology (HARM), which was developed jointly by the Air Force, CH2M HILL, and Engineering-Science for specific application to the Air Force Installation Restoration Program. The HARM system considers four aspects of the hazard posed by a specific site: the waste and its characteristics, the potential pathways for waste contaminant migration, the receptors of the contamination, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating. A more detailed description of the HARM system is included

in Appendix J. Copies of the completed rating forms are included in Appendix K. A summary of the overall hazard ratings is given in Table 7.

The following is a description of each site, including a brief discussion of the rating results.

1. <u>Landfills</u>

Sanitary landfill sites at Davis-Monthan AFB from pre-1940 until 1976 are discussed below. Since 1976, all general refuse from Davis-Monthan AFB has been collected by contractor and disposed of off-base in Pima County landfills.

- Site No. 1 was the main sanitary landfill for the entire base from the early 1940's (possibly prior to this time) until 1976 when on-base sanitary landfill operations ceased. The site was originally a gravel borrow pit, approximately 35-feet deep, which was excavated during construction of the main base and runway areas. The landfill operation consisted mainly of trenches excavated at the bottom of the pit with daily cover. As the operation expanded, some direct dumping at the bottom of the pit took place, with excavation of the sides of the pit providing daily cover. Some burning was done at the site prior to 1968. The site received all refuse from the base, including household garbage, scrap lumber and metal, construction debris, empty containers, paper, old tires, and other items. The site was also reportedly used for disposal of some hazardous materials, including paint residues and thinners, and solvents in drums at the rate of about 10 drums per month. Some

Table 7
SUMMARY OF RESULTS OF SITE RATINGS

Site No.	Site Description	Subscore (% of Maximum Possible Score in Each Category)[a]			Overall Score (Sum of Subscores/3)	Page Reference of Site Rating Form
		Receptors	Pathways	Characteristics		
1	Main Base Landfills	44	52	100	65	K-1
2	MASDC Landfill	62	52	30	48	K-3
3	Existing Fire Department Training Area	52	52	60	55	K-5
4	North Ramp Fire Department Training Area	52	44	60	52	K-7
5	Abandoned Fire Department Training Area	58	52	40	50	K-9
7	Old Electrical Substation Site	54	52	70	59	K-11
8	Transformer Oil Spill Site	54	52	50	52	K-13
10	Chemical Sludge Burial Site	44	44	80	56	K-15
17	MASDC/Ammo Area Drainage Ditch	36	52	80	56	K-17
18	MASDC Flush Farm Drainage Ditch	54	80	48	61	K-19
19	Runway No. 4 Drainage Ditch	62	52	64	59	K-21
20	Storm Drain Outfall Location No. 1	46	52	70	56	K-23
21	Storm Drain Outfall Location No. 2	52	52	70	58	K-25
25	MASDC Tow Road	57	52	70	60	K-27
26	Fuel Tank Sludge Burial Site	50	52	45	49	K-29

[a]Waste management multiplier was 1.0 for all sites.

transformer oil and fuel tank cleaning sludge from industrial shops may also have been disposed of at this site. Other wastes reportedly included pesticides (small quantities), photo lab chemicals, and discarded aircraft. Several drainage swales are in close proximity to the site, and area runoff has resulted in standing water at the bottom of the site after infrequent rainfall events. Since liquid hazardous wastes may have been disposed of at the site, the area runoff collection may provide a driving force for migration of contaminants through the unsaturated zone toward the water table. The overall rating score for this site (65) is due mainly to the high waste characteristics subscore (100). The receptor subscore of 44 is due primarily to the proximity of the site to the reservation boundary (640 feet). The pathways subscore of 52, is due primarily to the proximity of the site to nearby drainage swales (less than 20 feet).

- Site No. 2 was identified by several interviewees as an old landfill site which was located in the current MASDC area of the base near the East Gate and Kolb Road. The landfill was reportedly a small-scale operation used mainly for base housing refuse. The approximate time frame of operation was from the 1940's until 1955. A ground tour of this area did not indicate any obvious signs of past landfill activity. The overall rating score for this site (48) is due mainly to the relatively high receptors subscore (62) since the site is located in close proximity to the reservation boundary

(less than 20 feet) and to an off-base well (1,000-feet). The waste characteristics subscore of 30 is due to suspected small quantities of waste thinners and solvents which may have been disposed of at the site. The pathways subscore of 52 is due primarliy to a wash that currently runs through this area and may provide a driving force for contaminant migration after infrequent rainfall events.

2. Fire Department Training Areas

The locations of three fire department training areas were determined from the records search. These sites are discussed below:

- Site No. 3 is the existing fire department training area which has been in use since 1968. Currently, fire department training exercises are conducted once per month using about 200 gallons of JP 4 per exercise. Prior to 1972, the exercises were conducted once per week using contaminated fuels. It was reported that some dumping of waste oils and solvents in the fire department training area took place in the early 1970's. The majority of the POL wastes would have been consumed in the fire training exercises; however, some minor percolation into the ground may have taken place. The driving force for contaminant migration would be small because of the extremely low precipitation and high evaporation rate, and the presence of a low-permeability layer just below the the surface. The overall rating score for this site (55) is due mainly to the

waste characteristics subscore (60) since small quantities of POL wastes may have been disposed of at the site. The receptors subscore of 52 is due primarily to the proximity of the site to a base well (1,200 feet). The pathways subscore of 52 is due primarily to the proximity of the site to a drainage ditch (300 feet).

- Site No. 4 is the location of a former fire department training area located in the north ramp area of the base. The site was in use from approximately 1950 until 1968. Exercises were conducted about once per week using 200 gallons of POL waste, mainly waste fuels, per excerise. This site is still visible today as a circular area with a darkened surface. As with Site No. 3, most of the POL waste would have been consumed in the fire department training exercises, although some minor percolation into the ground may have taken place. The driving force for migration would be small because of the low precipitation and high evaporation rate and the presence of a low-permeability layer below the surface. The overall rating score for this site is 52 due mainly to the waste characteristics subscore (60) since small quantities of POL wastes, including some solvents, may have been disposed of at the site. The receptors subscore of 52 is due primarily to the proximity of the site to an off-base well (2,400 feet).

- Site No. 5 is the approximate location of a former fire department training area that was identified by one of the interviewees as the

original fire department training area in use during the 1940's. Information about this site is limited, but is it likely that the frequency of exercises and quantities of POL waste were similar to those at Site No. 4. A ground tour of the area did not give any direct indication of past fire department training activities. As with Sites No. 3 and 4, most of the POL waste would have been consumed in the fire department training exercises, but some minor infiltration into the ground may have taken place. Again, the driving force for migration would be small. The overall rating score for this site (50) is due mainly to the receptors subscore (58) because of the proximity of the site to a base well (2,000 feet) and to base housing (150 feet). The waste characteristics subscore (40) is due to the suspected small quantities of waste solvents which may have been disposed of at the site. The pathways subscore of 52 is due primarily to the proximity of the site to a nearby drainage ditch (300 feet).

- Site No. 6 is the location of an area where burning operations were conducted periodically from the 1950's until 1975. The site, often referred to as the "burn pile," was used mainly for the disposal of scrap lumber. The site was cleared in 1981, and is clearly visible in aerial photographs taken prior to this time. The site was used primarily for the disposal of non-hazardous materials (scrap lumber) therefore, rating is not required.

3. Suspected PCB Spill Areas

The locations of three areas where transformer oil spills (possible PCBs) have occurred in the past were determined from the interviews. These sites are discussed below:

- Site No. 7 is the location of an old electrical substation (no longer existing) which was near the present substation location. It was reported that a lightning strike in 1964 resulted in the destruction of four large transformers, causing approximately 10,000 gallons of transformer oil to spill onto the ground. It is not known if the transformer oil contained PCBs; however, the presence of PCBs must be considered suspect. The overall rating for this site (59) is due mainly to the high waste characteristics subscore (70). The moderate receptors subscore of 54 is due primarily to the proximity of the site to a base well (1,600 feet), while the moderate pathways subscore of 52 is due primarily to the proximity of the site to a nearby drainage ditch (200 feet).

- Site No. 8 is the location behind Building 4852 where transformer oil was reportedly dumped onto the ground in 1978. This was a one-time occurrence. The exact quantity of transformer oil involved is not known, but was probably in the range of 100-500 gallons. It is not known if the transformer oil contained PCBs; however, the presence of PCBs must be considered suspect. The overall rating for this site is 54. The

waste characteristics subscore of 50 is due to the suspected medium quantities of hazardous waste (PCB-containing oil) which may have been disposed of at the site. The receptors subscore of 54 is due primarily to the proximity of the site to a base well, while the pathways subscore of 52 is due primarily to the proximity of the site to a nearby drainage ditch (200 feet).

- Site No. 9 is an area adjacent to the present Civil Engineering Storage Yard where oil from stored transformers was dumped onto the ground in the past. Recent soil sampling in this area showed negative or very low PCB levels (less than 2 ppm). Nearby base well No. 9 was sampled and showed no PCBs present. Since sampling in this area showed no significant PCB contamination, rating of this site is not required.

4. Burial Sites Other than Landfills

The locations of seven burial sites other than landfills were determined from the records search. These sites are discussed below:

- Site No. 10 is the location adjacent to the main base landfill (Site No. 1) where a "chemical sludge" material was reportedly disposed of in shallow trenches from approximately 1970-1976. According to interviewees, a total of about 10 trenches were excavated, each approximately 20 feet long, 8 feet wide, and 3 ft deep. Each trench was filled with the sludge and then covered with dirt. The description of the

sludge, i.e., thin, reddish orange and foul smelling, indicates that it was probably sludge from fuel tank cleaning operations. It is known that contractor cleaning of the main POL bulk storage tanks took place during this time frame. Lead would have been present in the sludge since these tanks were used in the past to store leaded AVGAS. The overall rating for this site (56) is due mainly to the waste characteristics subscore (80).

- Site No. 11 is the location of a burial site where discarded aircraft parts were disposed of in the past. No known or suspected hazardous materials were disposed of at this site; therefore, rating of the site is not required.

- Sites No. 12, 13, and 14 are the locations of past and present Explosive Ordanance Disposal burial sites. These sites were used to dispose of the residue from the incineration or deterioration of unused or outdated ordnance. Most, if not all, of the hazardous constituents would have been destroyed in the incineration/detonation operations. Past practices may have introduced live munitions and ordnance into some of the burial sites. Although some of the burial sites may contain hazardous unexploded ordnance, no potential for contaminant migration exists; therefore, rating of these sites is not required.

- Site No. 15 is the location of a site at the base firing range which was used to bury brush and debris from the original clearing

of the firing range site. No known or suspected hazardous materials were disposed of at this site; therefore, rating of the site is not required.

o Site No. 16 is the location of a past disposal site for low-level radioactive materials including electron and x-ray tubes and possibly radium dials and low-level radioactive wastes from the base hospital. The material was placed in four cased augered holes. The site is currently fenced-off and marked. The encasement eliminates any pathways for migration of the waste material; therefore, rating of this site is not required.

5. Drainage Ditch Locations

There are numerous unlined drainage ditches located throughout Davis-Monthan AFB. Some of these drainage ditches, especially in the main base and MASDC areas, may have received waste oils and solvents in the past from spills, dumping, and past washrack operations. Some of the contaminants may have left the base with stormwater drainage after rainfall events. However, due to the extremely low precipitation and high evaporation rate, the majority of the contaminants, especially volatile solvents, would have evaporated into the atmosphere. Some residual contaminants may have infiltrated into the ground. Although the drainage ditches are dry most of the time, water in the ditches, especially after rainfall events, would provide a possible driving force for potential migration into the unsaturated zone. This migration potential would be much lower in the small, shallow drainage ditches (2-3 feet deep), because of the low-permeability layer just below the ground surface. The migration potential would be higher in

the deeper drainage ditches (4-10 feet deep) where breaching of the low-permeability layer has probably occurred. The following discussion includes those locations where the potential for contaminant migration is considered to be higher than at other drainage ditch locations.

- Site No. 17 is the location of a drainage ditch off Drexel Road near the southeast corner of MASDC property and the northeast corner of the ammunition storage area. According to interviewees the contents of approximately 1,000 portable fire extinguishers were emptied into this ditch in 1972. The contents probably included bromochloromethane, which was a common fire extinguishing agent used at that time. Visual inspection of the ditch site indicated recent dumping of brush and scrap metal debris from aircraft. It is possible that this site was also used in the past for the disposal of other items, including various liquid wastes from stored or salvaged aircraft components. This is a major drainage ditch, approximately 8 feet deep. The overall rating score for this site (56), is due mainly to the waste characteristics subscore (80). The receptors subscore is 36, since the site is not located near well supplies or the reservation boundary. The pathways subscore is 52 since periodic water in the ditch provides potential pathways for surface or subsurface migration.

- Site No. 18 is a drainage ditch site located adjacent to the MASDC flush farm waste oil storage tank. Drainage from nearby washdown operations also enters the ditch at this

location. Visual inspection of the site showed a significant amount of waste oil accumulation in the ditch from a recent spill. Numerous other spills probably occurred at this site, including possibly commingled waste oils and solvents. The overall rating score for this site (61), is due mainly to the high pathways subscore (80). The waste characteristics subscore of 48 is due to the medium quantities of waste oils known to have been spilled at the site. The receptors subscore of 54 is due primarily to the proximity of the site to a base well (1,600 feet).

- Site No. 19 is a drainage ditch located between the abandoned Runway No. 4 and Wherry housing. The early MASDC operations were previously conducted in the Runway No. 4 area, and it was reportedly common practice during the 1950's to drain waste oils and residual fuels from aircraft into the ditch prior to aircraft storage. Some waste solvents were also probably disposed of at this site. The overall score for this site (59), is due mainly to the relatively high waste characteristics subscore (64) and receptors subscore (62). The pathways subscore is 52, since the periodic occurrence of water in the ditch provides potential pathways for surface or subsurface migration.

- Sites No. 20 and 21 are outfall discharge points which receive storm drainage from the main base industrial shop areas. The outfall discharge points would be likely locations for the accumulation of waste solvents, oils,

and chemicals which may have been discharged to drainage ditches in the past. The overall rating scores for Sites No. 20 and 21 are 56 and 58, respectively, due mainly to the waste characteristics subscore (70) for both sites. The main difference between site scores is the low receptors subscore (46) for Site No. 20 compared to that for Site No. 21 (52), which is located near an off-base well (1,400 feet).

- Sites No. 22, 23, and 24 are shallow drainage ditches located near Buildings 4205, 4712, and 4812 in the vehicle maintenance area. Some small quantities of waste oils have reportedly been observed periodically in these ditches, primarily from the draining of engine oil from vehicles in nearby paved areas. Inspection of these ditches during the base visit did not indicate any recent oil dumping activity. The contents of these ditches drain to major drainage ditches and eventually to the outfall discharge points (Sites No. 20 and 21). Due to the presence of a low-permeability layer below the shallow ditches, the potential for subsurface migration is insignificant; therefore, rating of these sites is not required.

6. Other Sites

Ten other sites were identified from the records search. These include the MASDC tow roads, where extensive road oiling using POL waste was performed in the past, two sites for disposal of weathered fuel tank cleaning sludge, an asphalt emulsion spill site, and six past locations of

aluminum remelting furnaces in the MASDC area. These sites are discussed below:

- Site No. 25 includes the major MASDC tow roads where extensive road oiling was performed in the past for dust control. Waste oils, possibly including commingled waste oils and solvents, and some residual fuels were routinely collected in a waste oil storage tank located at the MASDC flush farm. Until about 1976, it was common practice to dispose of the waste oil by spreading on the dirt roads in the MASDC area. The major tow roads would have received most of the waste oil. It is estimated that 10,000 to 20,000 gallons per year of POL waste were disposed of in this fashion. The surface application of the POL waste on the compacted road surfaces and the extremely low precipitation and high evaporation rate would have resulted in the majority of the volatile components, including fuels and solvents, being evaporated into the atmosphere. Some of the POL waste may also have penetrated into the ground, where the biodegradable components would be degraded and assimilated by soil bacteria. The main concern is the fate of the solvents which may have been included into the commingled waste oil which may have infiltrated into the ground. Although the driving force for subsurface migration is very small, the total quantities involved in the road oiling operation are large. Therefore, the potential exists for subsurface contaminant migration. The overall score for this site is 60, due ma[illegible] to the waste characteristics subscore [illegible]

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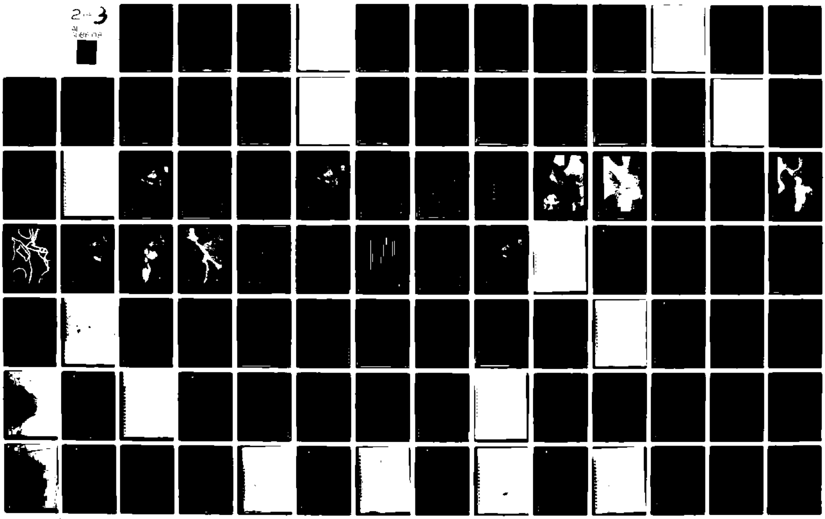


The receptors subscore of 57 is due primarily to the proximity of the site to a base well (200 feet) and to the reservation boundary (1,400 feet). The pathways subscore of 52 is due primarily to the proximity of the site to nearby drainage ditches (less than 5 feet).

- Site No. 26 is the location of the main POL bulk storage area where weathered sludge from periodic fuel tank cleaning operations was disposed of in the past. The sludge, consisting mainly of water with some rust, dirt, and fuel, was drained periodically (about once every 8 years) from the bottom of the fuel storage tanks at the rate of about 200 gallons of sludge per tank cleaning operation. The sludge was then weathered for 2 to 4 weeks and then buried in shallow trenches. The majority of the residual fuel and volatile components would have evaporated into the atmosphere during the weathering operation. Since AVGAS has been stored in these tanks in the past, some lead residue may have been present in the sludge. The overall score for this site is 49. The waste characteristics subscore of 45 is due to the lead which may be present in the sludge. The receptors subscores of 50 is due primarily to the proximity of the site to a base well (1,000 feet). The pathways subscore of 52 is due primarily to the proximity of the site to a nearby drainage ditch (200 feet).

- Site No. 27 is the location of a recent weathering site for small quantities of fuel tank sludge. This sludge has been analyzed

and is not a hazardous waste; therefore rating of the site is not required.

- Site No. 28 is the location of a small asphalt emulsion spill which occurred in 1979 from a leaking storage tank valve. The quantity spilled was small (less than 100 gallons) and the volatile components would have evaporated into the atmosphere. The potential for contaminant migration is insignificant; therefore, rating of this site is not required.

- Sites No. 29, 30, 31, 32, 33, and 34 are the approximate past locations of aluminum remelting furnaces in the MASDC area where aluminum was recovered from old aircraft carcasses. Some aluminum and steel residue from past operations may have been buried at these sites. However, no known or suspected hazardous materials were disposed of at these sites; therefore, rating of the sites is not required.

7. Summary

A total of 34 disposal and spill sites were identified at Davis-Monthan AFB. Of these, a total of 15 sites were rated using the HARM rating system. These sites were identified as having a potential for hazardous material contamination and migration. A complete listing of all of the sites, including potential hazards, is given in Table 8.

Table 8
DISPOSAL SITE RATING SUMMARY

Site No.	Waste Type	Potential Hazard Contamination	Migration	Rating
1	Industrial and Domestic Solvents	Yes	Yes	Yes
2	Domestic, suspect some industrial	Yes	Yes	Yes
3	POL, solvents	Yes	Yes	Yes
4	POL, solvents	Yes	Yes	Yes
5	POL, solvents	Yes	Yes	Yes
6	Scrap lumber	No	NA	No
7	Suspect PCBs	Yes	Yes	Yes
8	Suspect PCBs	Yes	Yes	Yes
9	Transformer oil, no PCBs	No[a]	NA	No
10	Chemicals, suspect fuel tank sludge	Yes	Yes	Yes
11	Aircraft parts	No	NA	No
12	Ordnance	Yes	No	No
13	Ordnance	Yes	No	No
14	Ordnance	Yes	No	No
15	Brush, debris	No	NA	No
16	Radioactive	Yes	No	No
17	POL, solvents	Yes	Yes	Yes
18	POL, solvents	Yes	Yes	Yes
19	POL, solvents	Yes	Yes	Yes
20	POL, solvents	Yes	Yes	Yes
21	POL, solvents	Yes	Yes	Yes
22	POL	Yes	No[b]	No
23	POL	Yes	No[b]	No
24	POL	Yes	No[b]	No
25	POL, solvents	Yes	Yes	Yes
26	Fuel tank sludge containing lead	Yes	Yes	Yes
27	Fuel tank sludge, no lead	No[a]	NA	No
28	Asphalt emulsion	No[a]	NA	No
29	Scrap metal	No	NA	No
30	Scrap metal	No	NA	No
31	Scrap metal	No	NA	No
32	Scrap metal	No	NA	No
33	Scrap metal	No	NA	No
34	Scrap metal	No	NA	No

NA = Not applicable using decision tree methodology

[a]Hazardous wastes not generated in quantity sufficient for contamination.

[b]Migration potential exists but is insignificant.

V. CONCLUSIONS

A. No direct evidence was found to indicate that migration of hazardous contaminants exists within or beyond Davis-Monthan AFB boundaries. Analyses of active base water supply wells for heavy metals, pesticides, and trichloroethylene (TCE) indicate no presence of hazardous contaminants in the ground water beneath Davis-Monthan AFB. Analyses of several off-base water supply wells, located in close proximity and downgradient from Davis-Monthan AFB, likewise indicate no presence of hazardous contaminants in the area ground water.

B. Information obtained through interviews with 50 past and present base personnel, base records, shop folders, well logs, soil borings, water quality analyses, and field observations indicates that hazardous wastes have been disposed of on Davis-Monthan AFB property in the past.

C. The records search indicated that TCE has been used in small quantities, but that no large-scale use of TCE has occurred at Davis-Monthan AFB in the past. Based on the above, the potential for a large-scale TCE contamination problem at Davis-Monthan AFB is considered to be low.

D. No evidence of environmental stress resulting from past disposal of hazardous wastes was observed at Davis-Monthan AFB.

E. The potential for migration of hazardous contaminants is low because of (1) low ground-water table, (2) extremely low precipitation, (3) extremely high evaporation rate, and (4) the presence of a low-permeability layer just below the ground surface.

Although low, the potential for contaminant migration exists because of (1) moderate permeability of the soil beneath the low-permeability layer and (2) the absence of continuing impermeable confining strata in the unsaturated zone above the water table.

F. The surficial soils in the Davis-Monthan AFB area contain a low-permeability layer just below the surface. In order for any significant pathways for ground-water contamination to exist, this layer would have to be breached. Disposal sites at Davis-Monthan AFB where breaching has probably occurred include base landfills, burial sites, and some of the deep unlined drainage ditches in the main base and MASDC areas. It is possible that hazardous contaminants may be migrating through the unsaturated zone and may not yet have reached the water table.

G. Table 9 presents a priority listing of the rated sites and their overall scores. The following sites were designated as areas showing the most significant potential (relative to other Davis-Monthan AFB sites) for environmental impact.

1. Site No. 1 (Main Base Landfill)

This site was the main sanitary landfill for the entire base from the early 1940's until 1976. Hazardous wastes, including waste thinners and solvents in drums, may have been disposed of at this site. Runoff entering the site after rainfall events may provide a driving force for subsurface contaminant migration.

Table 9

PRIORITY LISTING OF DISPOSAL SITES

Site No.	Site Description	Overall Score
1	Main Base Landfill	65
18	MASDC Flush Farm Drainage Ditch	61
25	MASDC Tow Road	60
7	Old Electrical Substation Site	59
19	Runway No. 4 Drainage Ditch	59
21	Storm Drain Outfall Location No. 2	58
20	Storm Drain Outfall Location No. 1	56
10	Chemical Sludge Burial Site	56
17	MASDC/Ammo Area Drainage Ditch	56
3	Existing Fire Department Training Area	55
8	Transformer Oil Spill Site	52
4	North Ramp Fire Department Training Area	52
5	Abandoned Fire Department Training Area	50
26	Fuel Tank Sludge Burial Site	49
2	MASDC Landfill	48

2. <u>Sites No. 17, 18, 19, 20, and 21 (Drainage Ditch and Storm Drain Outfall Locations)</u>

The above sites are locations where waste oils and solvents are known or suspected to have accumulated from past disposal practices and spills. Although the drainage ditches are dry most of the time, water in the ditches after rainfall events would provide a possible driving force for migration of contaminants into the unsaturated zone.

3. <u>Site No. 25 (MASDC Tow Road)</u>

Road oiling of the major tow roads in the MASDC area was used extensively in the past for disposal of POL wastes, possibly including commingled waste oils and solvents. Although the driving force for subsurface migration is very small, the total quantities involved in the road oiling operations are very large. Therefore, the potential exists for subsurface contaminant migration.

4. <u>Sites No. 7 and 8 (Transformer Oil Spill Sites)</u>

Transformer oil was reportedly spilled or dumped on the ground at both of the above sites. It is not known if the transformer oil contained PCBs; however, the presence of PCBs must be considered suspect.

5. <u>Site No. 10 (Chemical Sludge Burial Site)</u>

Site No. 10 is the location adjacent to the main base landfill (Site No. 1) where a "chemical sludge" material was reportedly disposed of in shallow trenches. Although the "chemical sludge"

is believed to be fuel tank cleaning sludge, the exact nature of the material is not known.

H. The remaining sites (Sites No. 2, 3, 4, 5, and 26) are not considered to present significant environmental concerns. Therefore, these sites do not warrant additional study.

VI. RECOMMENDATIONS

A. Phase II Program

A limited Phase II monitoring program is suggested to confirm the absence of hazardous contaminants and migration. The priority for monitoring at Davis-Monthan AFB is considered moderate, since no imminent hazard has been determined.

1. Tables 10 and 11 present a summary of recommended monitoring sites, parameters to be measured, and the rationale for the analyses. Specifically, monitoring is recommended for the main base landfill (Site No. 1), selected drainage ditch and storm drain outfall points (Sites No. 17, 18, 19, 20, and 21), the MASDC tow road (Site No. 25), two transformer oil spill sites (Sites No. 7 and 8), and the chemical sludge burial site (Site No. 10). Approximate monitoring well and soil sampling locations are shown on Figure 18.

2. For the main base landfill (Site No. 1), monitoring wells should be installed and soil sampling should be conducted.

    a. Monitoring Wells

    Two downgradient monitoring wells should be installed. The well should be drilled to a depth 30 feet below the water table (approximately 330 feet) and screened from 10 feet above to 30 feet below the water table. An existing upgradient base well, e.g., Base Well No. 6, can be used to determine background water quality. The

Table 10
RECOMMENDED ANALYSES

Sample Type	Parameter					
	Volatile Organic Compounds	PCBs	Heavy Metals	Pesticides	Phenols	COD, TOC Oil & Grease
Monitoring Wells						
Main Base Landfill (Site No. 1)	X	X	X	X	X	X
Soil Samples						
Main Base Landfill (Site No. 1)	X	X	X	X	X	X
MASDC Flush Farm Drainage Ditch (Site No. 18)	X		X		X	X
Storm Drain Outfall Location No. 2 (Site No. 21)	X		X		X	X
MASDC Tow Road (Site No. 25)	X	X	X			X
Old Electrical Substation Site (Site No. 7)		X				
Transformer Oil Spill Site (Site No. 8)		X				
Chemical Sludge Burial Site (Site No. 10)	X		X		X	X

Table 11
RATIONALE FOR RECOMMENDED ANALYSES

Parameter	Rationale
Volatile Organic Compounds	Organic solvents used on-base (past and present)
Phenols	Phenolic cleaner and paint stripper used in past
Heavy metals (lead, nickel, chromium, cadmium, and silver)	Potential sources identified (leaded fuel, batteries, paint, photo lab wastes)
PCBs	Transformer oil spills and disposal, suspect PCBs
Pesticides (including DDT and 2,4-D)	Commonly used at Davis-Monthan AFB in past
COD, TOC, oil and grease	Indicators of nonspecific contamination

wells should be analyzed for volatile organic compounds, phenols, COD, TOC, oil and grease, PCBs, pesticides (including DDT and 2,4-D), and suspect heavy metals (lead, chromium, nickel, cadmium, and silver). The monitoring wells should continue to be sampled periodically, every 1 to 2 years, to determine the potential for long-term contaminant migration.

b. Soil Sampling

A number of exploratory test borings should be conducted in the landfill site down to the bottom of the landfill (about 35 feet). Based on visual observations, i.e., lack of obstructions during the borings, two good sites should be selected for deep borings down to a depth of about 200 feet. Any sites where obstruction is encountered during the test borings, e.g., drums, major aircraft parts, etc., should be eliminated as possible sites for the deep borings due to the possibility of contamination of deep samples and misleading results. It is also important that the deep borings do not extend to the water table to eliminate the possibility of inadvertently providing a pathway for contaminant migration. Soil samples should be collected every 10 feet and analyzed every 50 feet to determine if a contaminant front is moving through the unsaturated zone toward the water table. If positive results are found, then additional samples should be analyzed to determine the extent of the contaminant migration.

3. For the selected drainage ditch outfall point locations, it is recommended that two sites, the MASDC flush farm drainage ditch (Site No. 18) and storm drain outfall location No. 2 (Site No. 21), be selected for soil sampling. One deep soil boring, approximately 200 feet, should be conducted at each site. Again, it is important that the deep borings do not extend to the water table to eliminate the possibility of inadvertently providing a pathway for contaminant migration. Soil samples should be collected at 10-foot intervals and analyzed at 50-foot intervals for volatile organic compounds, phenols, suspect heavy metals, COD, TOC, and oil and grease. If positive results are found, then additional samples should be analyzed to determine the extent of contaminant migration through the unsaturated zone, and additional soil borings should be conducted at the remaining drainage ditch and outfall point locations (Sites No. 17, 19, and 20). In the event that PCBs are detected at Site No. 7, soil samples from Site No. 21 should also be analyzed for PCBs.

4. For the MASDC tow road (Site No. 25), soil borings at two locations should be conducted down to a depth of approximately 20 feet. Two soil samples from each boring, one above and one below the low-permeability layer, should be collected and analyzed for volatile organic compounds, PCBs, suspect heavy metals, COD, TOC, and oil and grease. This sampling is recommended to determine if contaminant migration below the hardpan layer is occurring as a result of past road oiling practices.

5. For the transformer oil spill sites (Sites No. 7 and 8), soil sampling should be conducted at a minimum of six locations at each site. Soil samples should be composited from each location from 6-inch and 3-foot depths and analyzed for PCBs.

6. For the chemical sludge burial site (Site No. 10), one soil boring should be conducted to a depth of about 20 feet. Soil samples should be collected above and below the low-permeability layer and analyzed for volatile organic compounds, suspect heavy metals, COD, TOC, and oil and grease.

7. It is important that, after completion, all soil borings be properly filled and sealed to prevent the formation of potential migration pathways.

8. The final details of the monitoring program, including the specific locations of ground-water monitoring wells and soil sampling points, should be finalized as part of the Phase II program. It is not the intent of the Phase I program to assess the exact location or depth of any ground-water monitoring wells or soil sampling points, but to provide guidance for the Phase II contractor.

9. In the event that contaminants are detected, a more extensive field survey program should be implemented to determine the extent of contaminant migration. The Phase II contractor should be responsible for evaluating the results of the program outlined above and for recommending additional monitoring, as appropriate.

B. In-House Environmental Monitoring Program

In addition to the limited Phase II monitoring, it is recommended that the following program be conducted by the base.

1. The base should continue its program of comprehensive sampling and analysis of active base water supply wells. It is recommended that a volatile organic compound analysis be routinely included in addition to the analyses currently performed. This monitoring is recommended as a precautionary measure to determine if a long-term contaminant migration potential exists.

2. As a precautionary measure, the base should determine the condition of the following waste storage tanks through the use of pressure testing for leaks:

    a. MASDC flush farm waste oil holding tank

    b. Holding tank for oil/water separator skimmings (while the tank remains in-service)

    c. Holding tanks (3) for missile maintenance washdown water

VII. TITAN MISSILE SITES

A. DESCRIPTION

In 1960, Davis-Monthan AFB was selected as the site of the first operational Titan II ICBM Missile Wing. Construction began in 1960 and by March, 1963 the first Titan II Missile went on alert. There are 18 Titan II Missiles spread over southern Arizona at sites within a 24- to 63- mile radius of Davis-Monthan AFB. The approximate locations of the Titan Missile Sites are shown on Figure 19.

The 390th Strategic Missile Wing (SMW) is responsible for the management, maintenance, and operation of all 18 sites. The mission of the 390th SMW is to be prepared to launch the Titan Missile on lawful order. The 18 storage and launching complexes are manned by four-man combat crews who serve 24-hour alert tours. Each site is situated within a 1- to 2-acre fenced-in area, with approximately 200 acres of land surrounding the complex acting as a buffer zone. The three main components of the underground complexes are the missile launch silo, the launch control center, and the blast lock structure. The missile launch silo is an eight-level shaft approximately 155 feet deep and with an inside diameter of 55 feet.

B. TITAN GEOLOGY/HYDROLOGY

The Titan Missile Sites are located within the Mexican Highlands Section of the Basin and Range province. This province is characterized by generally north to northwest-trending isolated ranges separated by desert plains. In the Mexican Highlands Section, mountains make up nearly half of the area. Most of the 18 Titan Missile Sites are located within the desert plains between the mountain ranges (see Figure 19). The plains or basins consist of

several thousand feet of unconsolidated sediments overlying the crystalline basement rock. The sites located within the ranges (Sites No. 570-3 and 571-5) occur within small valleys within the mountainous section.

As with the Tucson Basin, most of the desert plains within which the Missile Sites are located are covered with gravelly or sand loam, sometimes leaving a calcareous cemented layer at approximately 3 feet in depth. Permeabilities of these soils are moderate to low depending on the degree of cementation.

Since the sites are located within the flat basins, they are generally close to surface drainage systems, primarily tributaries of the Santa Cruz or San Pedro Rivers. Typical of the desert southwest, these surface streams or washes are dry most of the time.

Ground water occurs in the unconsolidated sediments of the desert plain and most of the sites (exceptions are Sites No. 570-1, 570-3, and 571-4) use wells for potable water supply. Depth to ground water varies, but is generally greater than 50 feet and in some cases as deep as 300 feet below land surface.

Water quality analyses conducted at all Missile Sites which contain wells have not shown any unusually high concentrations of metals, non-metals, or organics. However, some of the sites have shown radioactivity, which is naturally occurring in ground water at those sites. Well analyses include gross alpha activity, uranium 235, 238, and 234, and radium 226. Wells at the following sites had naturally occurring levels above detection limits, primarily for gross alpha activity: 570-1, 570-2, 570-3, 570-9, 571-2, 571-3, 571-4, 571-5, 571-6, 571-7, and 571-9.

C. FINDINGS

1. Potable water at 15 of the 18 sites is supplied by wells. Water is supplied to the remaining three sites (Sites No. 570-1, 570-3, and 571-4) by private water company pipeline. Each site is furnished with a water storage reservoir, and chlorination of the water supply is provided if needed. Drinking water monitoring requirements are fulfilled by Bioenvironmental Engineering personnel.

2. All sanitary sewage is pumped "top side" to a septic tank. The effluent from the septic tank is discharged to either a leach field or an oxidation pond. Six of the 18 sites have leach fields (Sites No. 570-5, 570-6, 570-9, 571-7, 571-8, and 571-9), while the remaining 12 sites have oxidation ponds.

3. All solid refuse generated at the sites is collected and transported back to Davis-Monthan AFB for proper off-base disposal.

4. All maintenance conducted on the Titan Missiles is performed by the 390th MIMS. The engine oil is changed twice per year, generating approximately 6 gallons of waste engine oil per site per year. Small quantities of PD 680 and MEK are used for cleaning operations. The PD 680 and MEK are consumed in use, and the rags are transported back to the main base. Approximately 6 gallons of paint, 1 gallon of paint thinner, and 1 quart of enamel lacquer are used per site per year for touch-up painting and corrosion control. The majority of the paint, paint thinner, and enamel lacquer are consumed in use. Freon and methanol

are used for leak testing, which generates approximately 5 gallons of Freon and 5 gallons of methanol per site per year. Also, varying quantities of waste hydraulic fluid and waste diesel fuel are generated at each site. All waste materials are collected and transported back to the main base for proper disposal.

4. There are three large presumed PCB capacitors and one presumed PCB transformer at each of the 18 sites. It was reported that several minor PCBs spills have occurred due to a ruptured or leaking capacitor (Filter Box 14) at several of the sites. The leaks or spills were entirely contained within the silo, and corrective clean-up procedures were followed.

5. Any spills of paints, oils, or solvents which might occur during maintenance activities in the launch silo would be collected in the sump. The sump is located below the 8th level in the launch silo and would receive any spills which might occur on any of the eight working levels. Materials occasionally found in the sump include diesel fuel, engine oil, hydraulic fluid, and water. The sump is inspected visually on a daily basis and when the quantity of waste becomes significant, it is analyzed by Bioenvironmental Engineering and the correct neutralization procedures, if needed, are determined. The waste material is neutralized and pumped "top side" to a drainage ditch. The drainage ditches at the 18 missile sites are dry year-round except during and after rainfall events. There was no evidence of contamination or environmental stress found during a ground tour conducted at one of the complexes. Due to the extremely low precipitation

and extremely high evaporation rate, the majority of the volatile components in the waste are evaporated into the atmosphere. Some of the waste material may infiltrate into the ground where the biodegradable components in the waste would be degraded and assimilated by soil bacteria.

6. There are two unloading hardstands (a fuel unloading hardstand and an oxidizer unloading hardstand), located on the surface of every complex. These hardstands are equipped with washracks and an underdrain system to collect any spills which might occur during unloading of fuel or oxidizer. Any fuel or oxidizer which is collected during a spill is contained in the hardstand sumps. The contents of these sumps are analyzed by Bioenvironmental Engineering and neutralized prior to discharge to the drainage ditch. Interviews with long-term employees did not indicate any significant past spills of missile fuel (Aerozine 50) or oxidizer (nitrogen tetroxide) at any of the Titan Missile Sites.

7. Two of the Titan Missile Sites, a typical encroached site and a typical remote site, were rated using the U.S. Air Force Hazardous Assessment Rating Methodology. The overall rating scores for these sites were low, 49 and 47 for the typical encroached site and typical remote site, respectively. These overall scores were lower than virtually any of the 15 rated sites located on the main base. The only rating factor which differed between the typical encroached site and the typical remote site was the land use/zoning within a 1-mile radius of the site.

D. CONCLUSIONS

1. There is one drainage ditch at each of the 18 Titan Missile Sites which receives small quantities of neutralized waste materials from the launch silo and hardstand sumps. The waste materials include diesel fuel, engine oil, hydraulic fluid, and neutralized byproducts of Aerozine 50 and nitrogen tetroxide.

2. The potential for migration of hazardous contaminants in the drainage ditches is low because of (1) low ground-water table, (2) extremely low precipitation, (3) extremely high evaporation rate, and (4) the presence of a low-permeability layer just below the ground surface.

3. Other than the drainage ditch at each complex, the records search did not identify any other disposal or burial sites at any of the 18 Titan Missile Sites.

E. RECOMMENDATIONS

1. Additional Phase II monitoring is not considered necessary at any of the 18 Titan Missile Sites. The sites are not considered to present significant environmental concerns.

2. Davis-Monthan AFB should continue its program of sampling and analysis of the launch silo sump, fuel hardstand sump, and oxidizer hardstand sump prior to discharge to the drainage ditch.

VIII. MT. LEMMON AIR FORCE STATION

A. DESCRIPTION

Mt. Lemmon Air Force Station is located approximately 18 miles northeast of Davis-Monthan AFB near the crest of the Santa Catalina Mountains at an elevation of 9,120 feet above msl. Mt. Lemmon currently operates as a USAF Repeater Station. The station is situated on a two-acre fenced-in area on which three antennas and an unmanned communications center are located. The Mt. Lemmon Repeater Site is operated and maintained by the 1903rd Communication Squadron. No significant maintenance activities are conducted at the site.

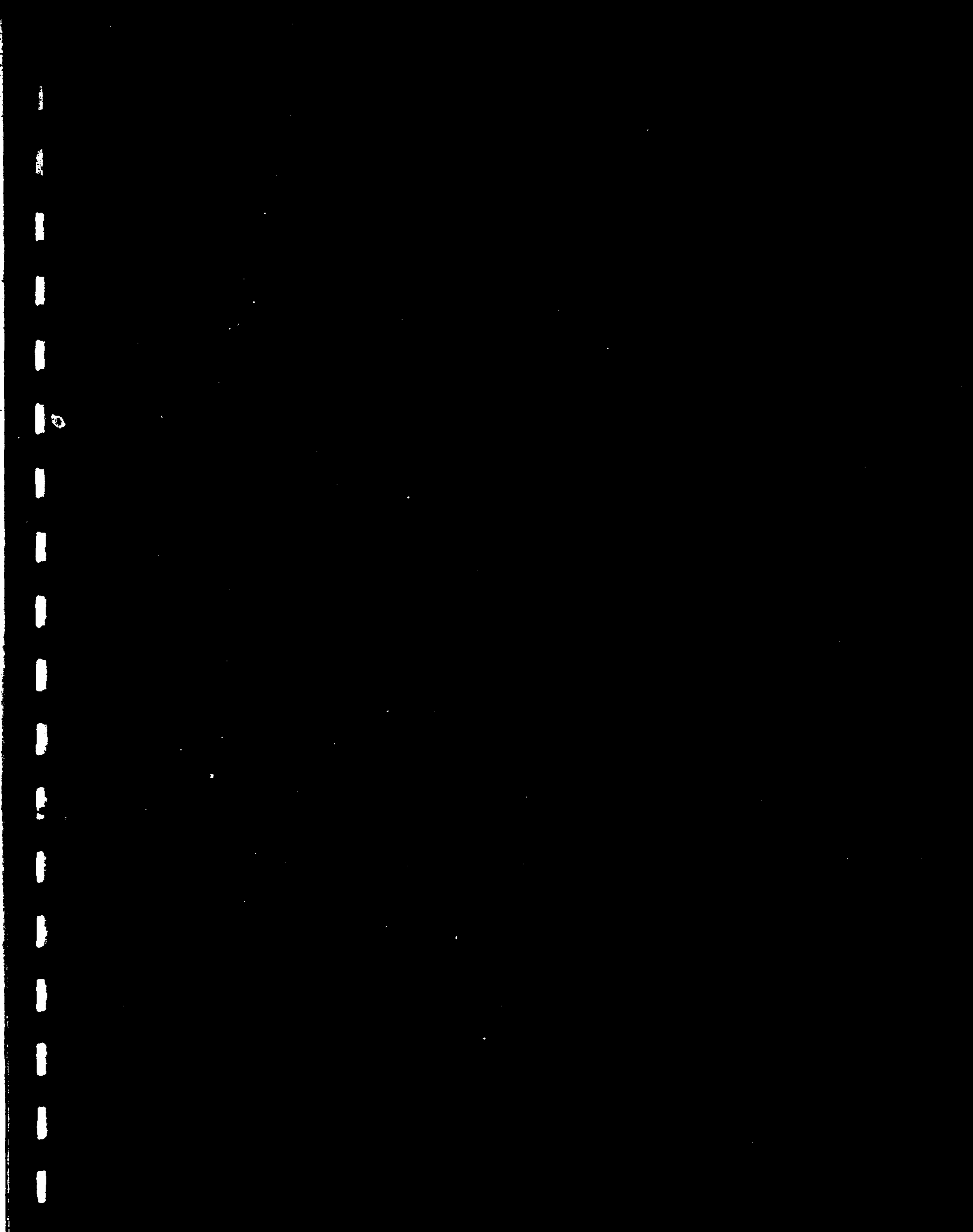
Mt. Lemmon Air Force Station was originally operated as an Air Command and Warning Station from 1956 to 1969. Approximately 250 people were stationed at the site. Since 1969, approximately 12 out of the 14 acres have been excessed to the University of Arizona, including the majority of the facilities. Industrial activities conducted in the past were minor. The records search team conducted a helicopter overflight of Mt. Lemmon Air Force Station. The records search did not identify any past disposal or burial sites. The solid waste was removed by a contractor. The sanitary sewage was treated in a septic tank, and the septic tank effluent discharged down the northern canyon wall. The septic tank was periodically cleaned out by a contractor.

B. CONCLUSIONS

1. The records search did not identify any past disposal or spill sites at Mt. Lemmon Air Force Station.

C. RECOMMENDATIONS

1. Additional Phase II monitoring is not considered necessary at Mt. Lemmon Air Force Station.



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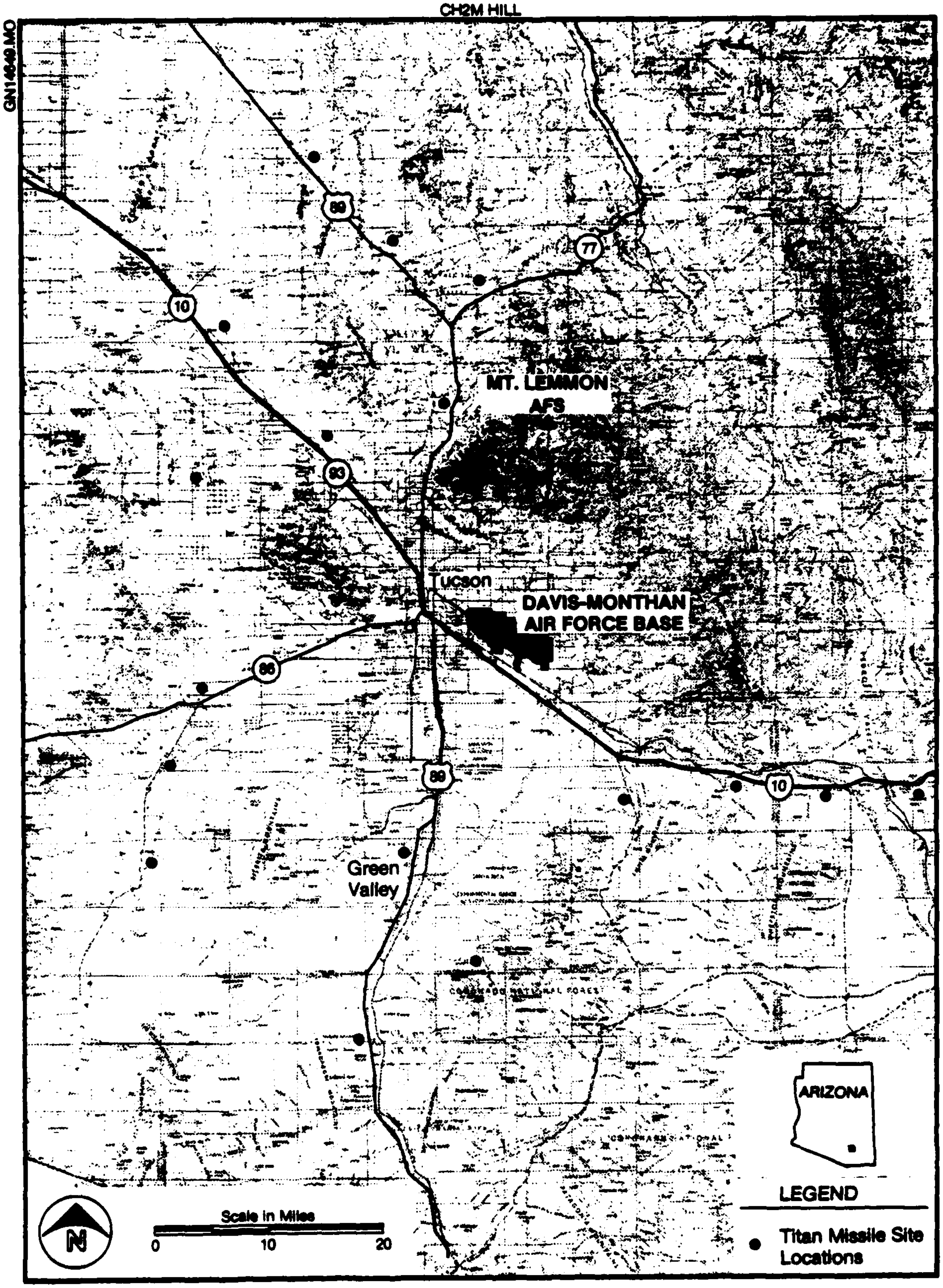

FIGURE 1. Location of Davis-Monthan AFB, Titan Missile Sites, and MT. Lemmon Air Force Station.

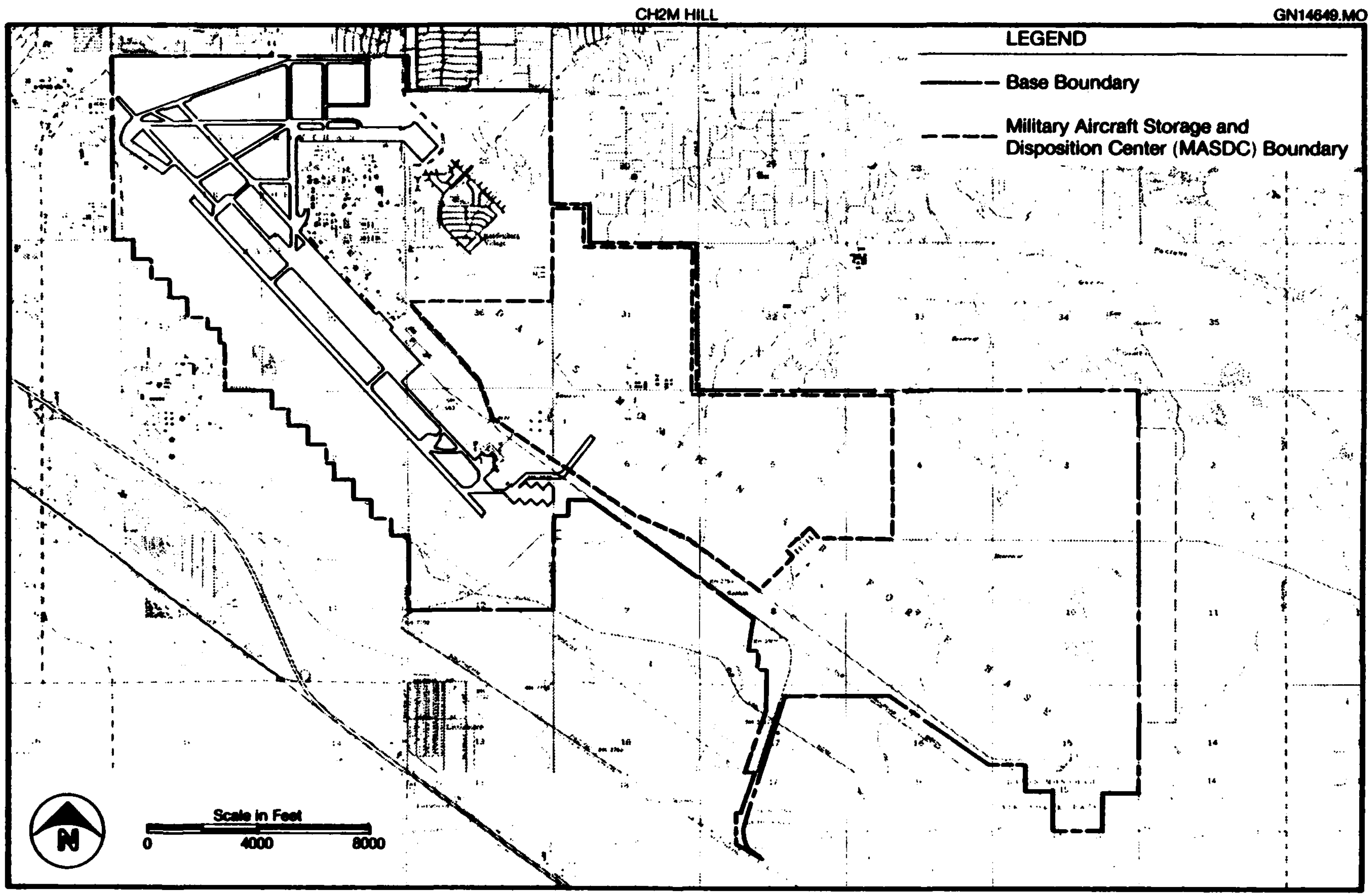

FIGURE 2. Site map of Davis-Monthan AFB.

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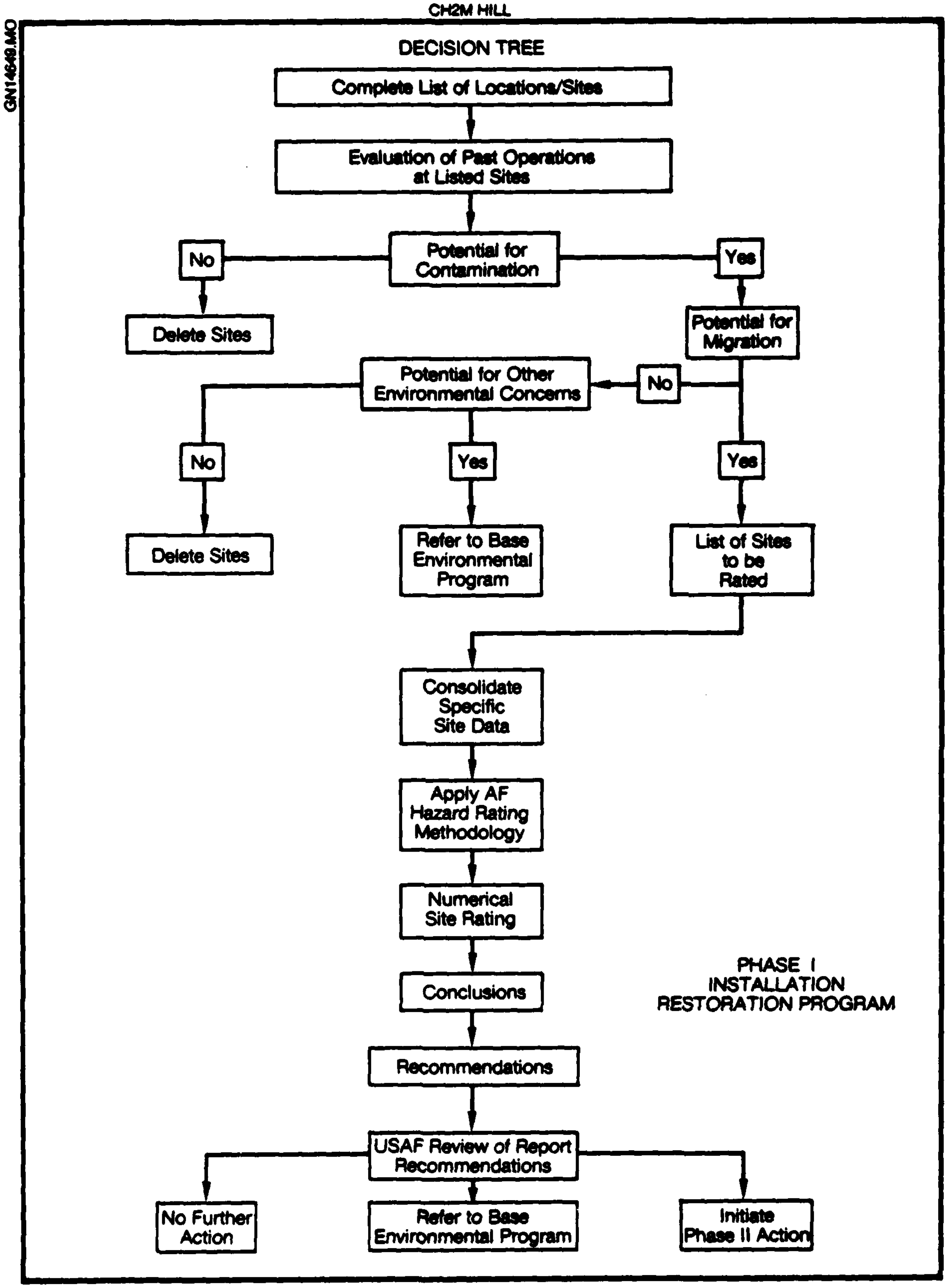

FIGURE 3. Records search methodology.

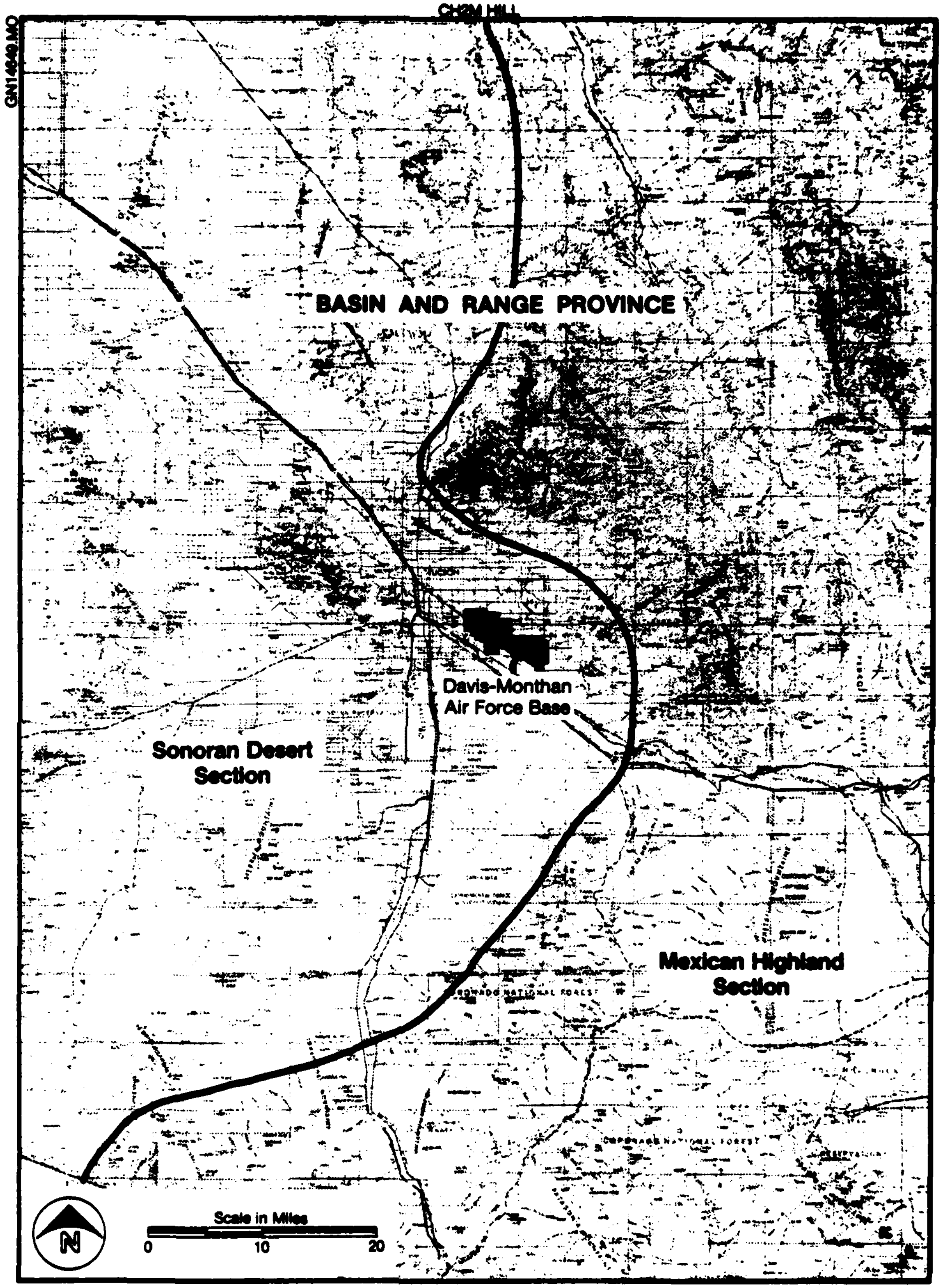

FIGURE 4. Physiographic map.

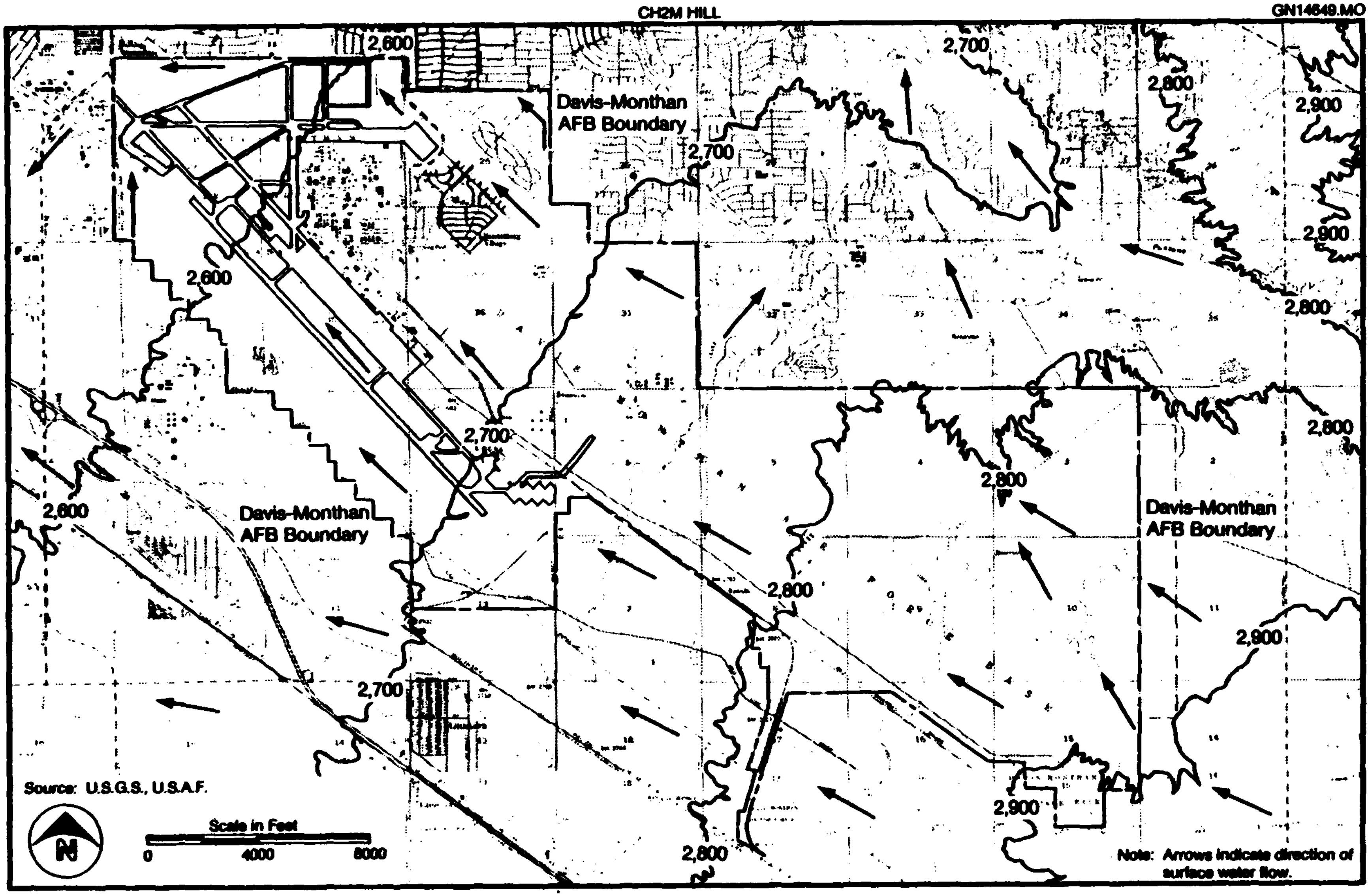

FIGURE 5. Topography and drainage map of Davis-Monthan AFB.

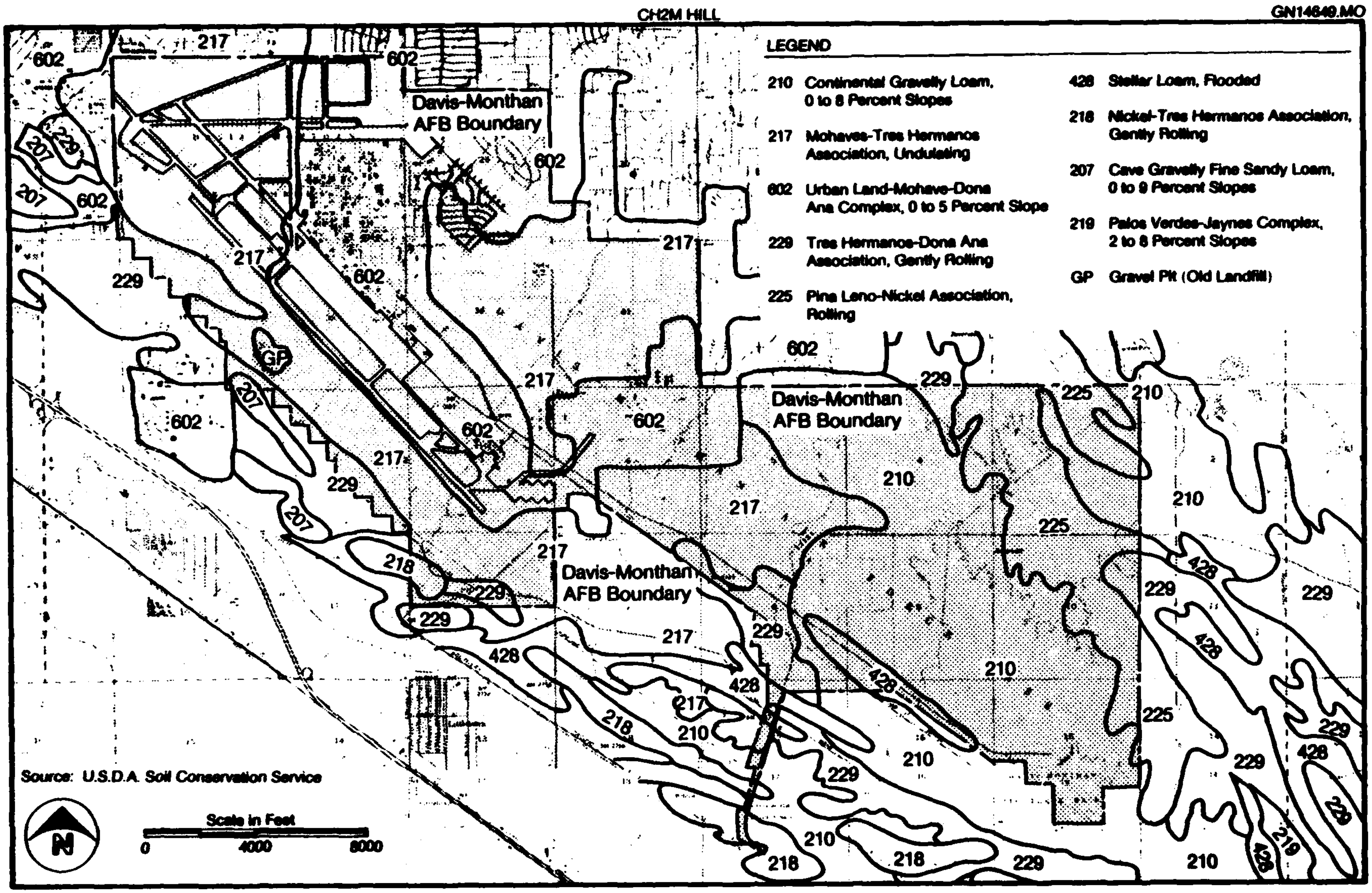

FIGURE 6. Soils map.

FIGURE 7. LEGEND

SEDIMENTARY AND VOLCANIC ROCKS

Quaternary and Upper Tertiary (Pliocene) Sedimentary Rocks, Mostly Unconsolidated; Includes Scarce Lava and Silicic Tuff

Middle Tertiary (Miocene and Oligocene) Sedimentary Rocks; Locally Includes Lava and Tuff

Middle Tertiary Volcanic Rocks of Silicic to Basaltic Compositon; Includes Related Intrusive Rocks

Cretaceous Sedimentary Rocks

Lower Tertiary to Triassic Volcanic Rocks; Includes Some Sedimentary Rocks

Mississippian through Cambrian Sedimentary Rocks on Colorado Plateau; All Paleozoic Sedimentary Rocks in Basin and Range Province

Younger Precambrian Sedimentary Rocks and Intrusive Diabase

Older Precambrian Rocks of All Types, Including Schist, Gneiss, and Fine-to-Course-Grained Igneous Rocks

METAMORPHIC AND INTRUSIVE IGNEOUS ROCKS

Tertiary and Upper Cretaceous Intrusive Igneous Rocks

Mid-Cretaceous to Triassic Intrusive Igneous Rocks

Post-Paleozoic Gneiss and Schist

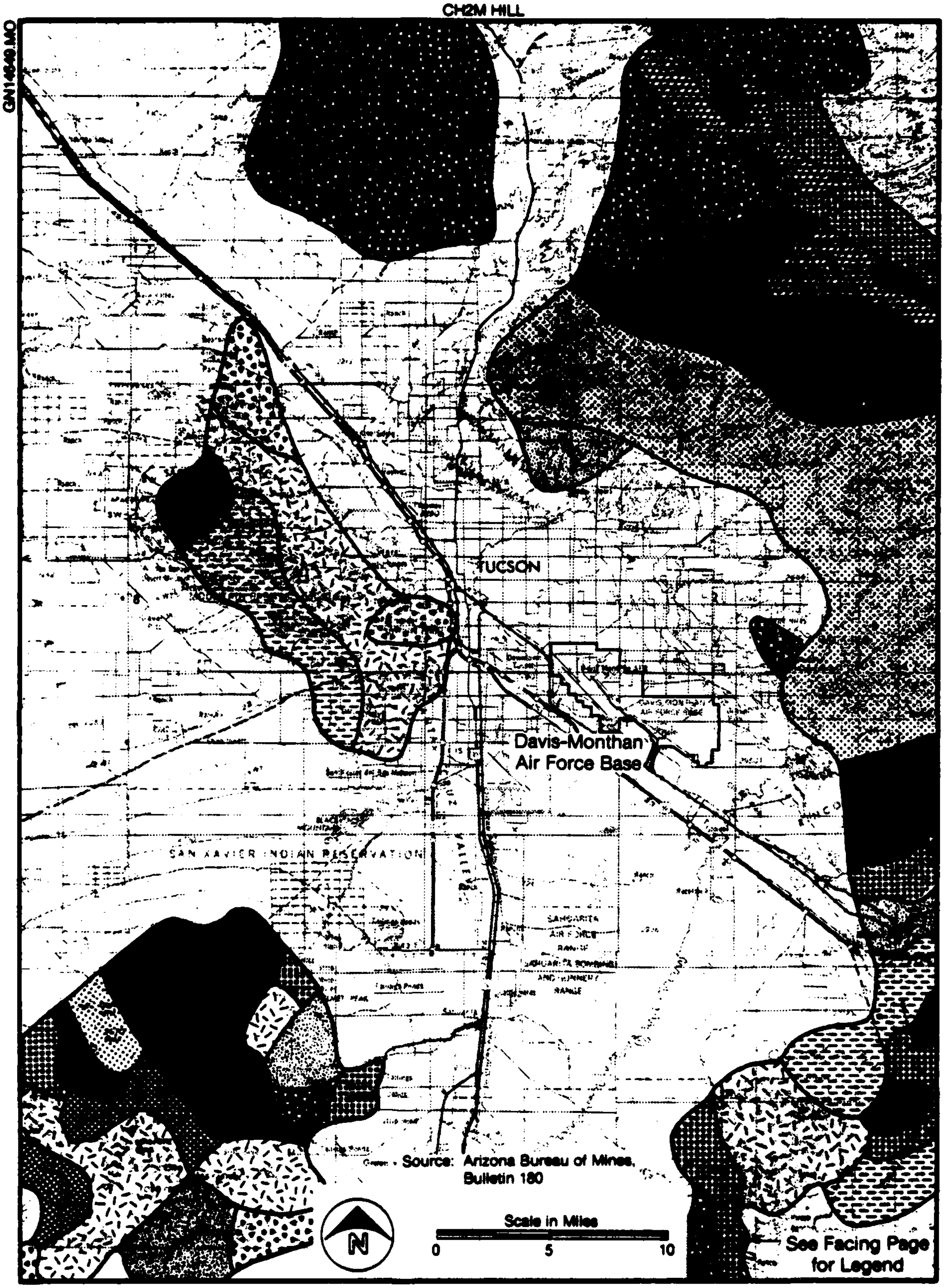

FIGURE 7. Geologic map.

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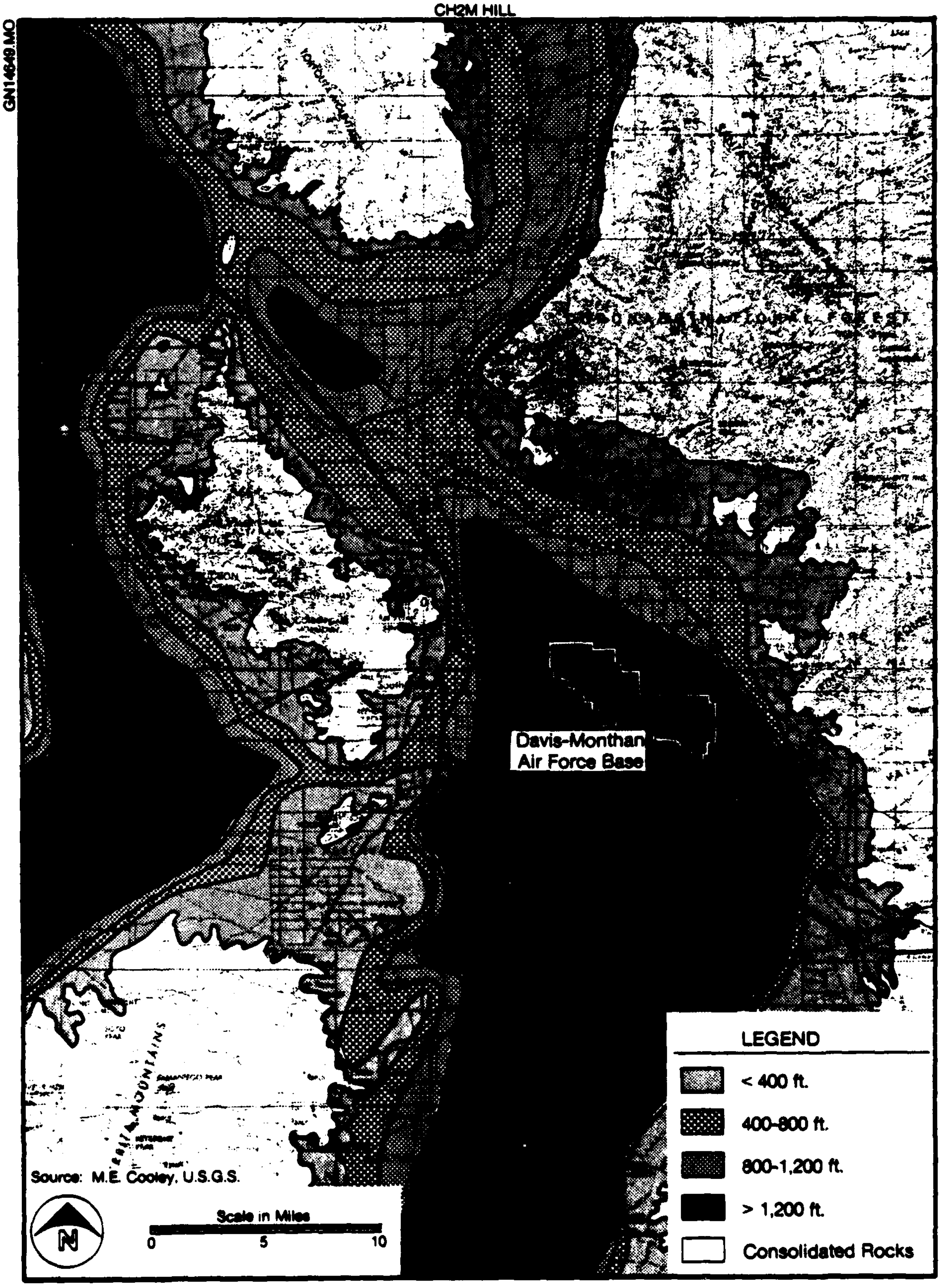

FIGURE 8. Distribution and estimated thickness of Alluvial Deposits.

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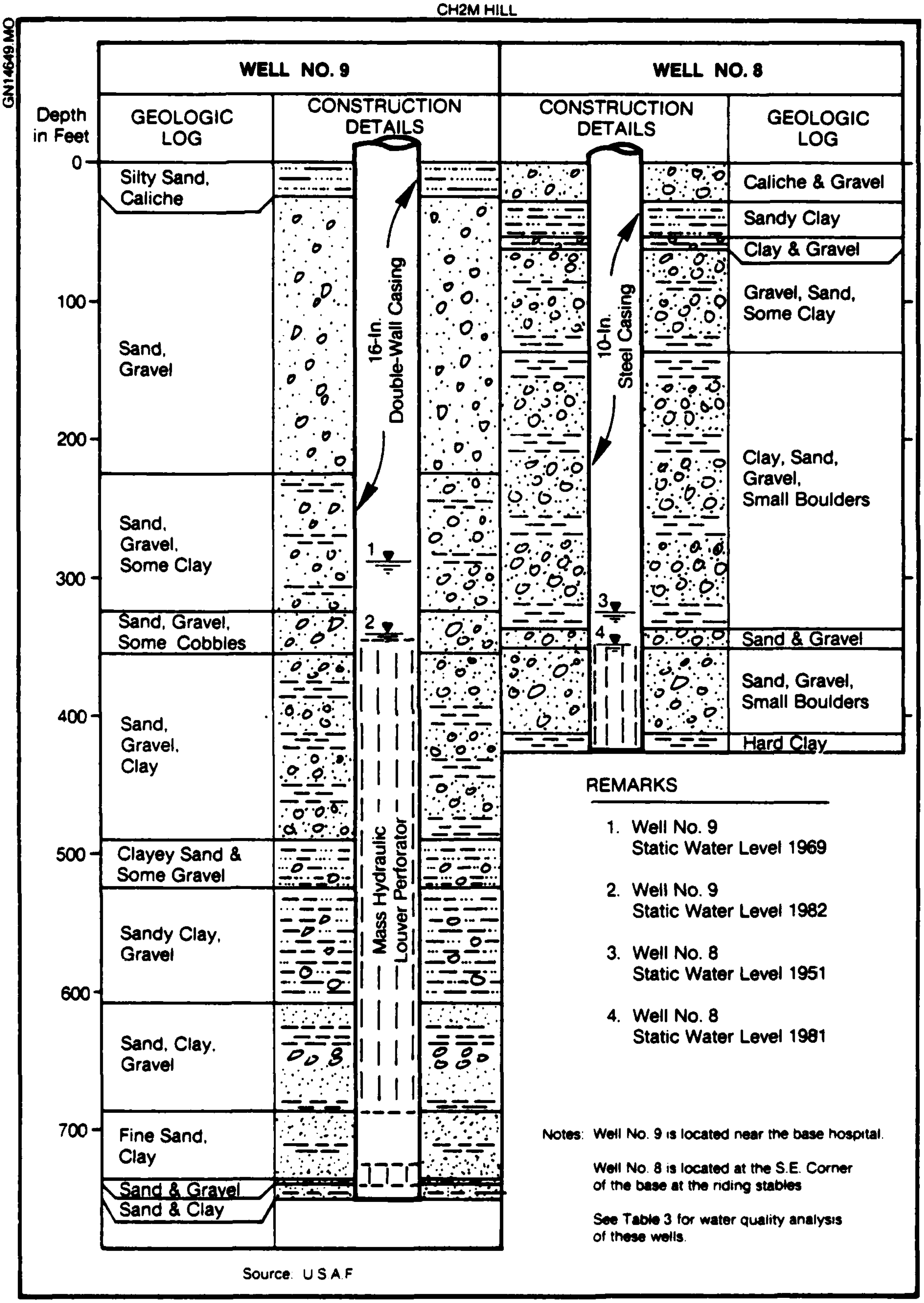

FIGURE 9. Geologic log and well construction detail of typical water wells at Davis-Monthan AFB.

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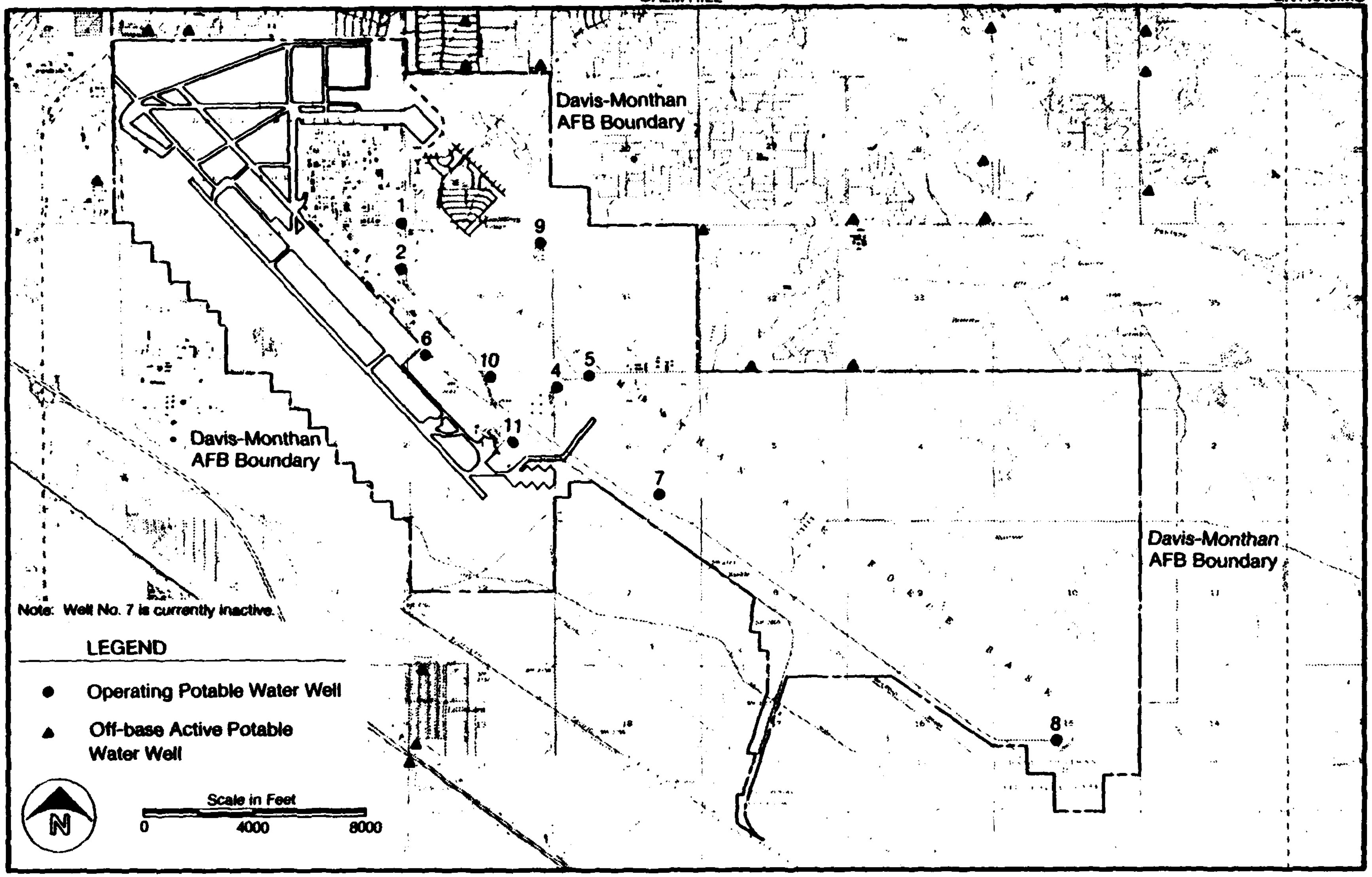

FIGURE 10. Location of water wells at Davis-Monthan AFB and vicinity.

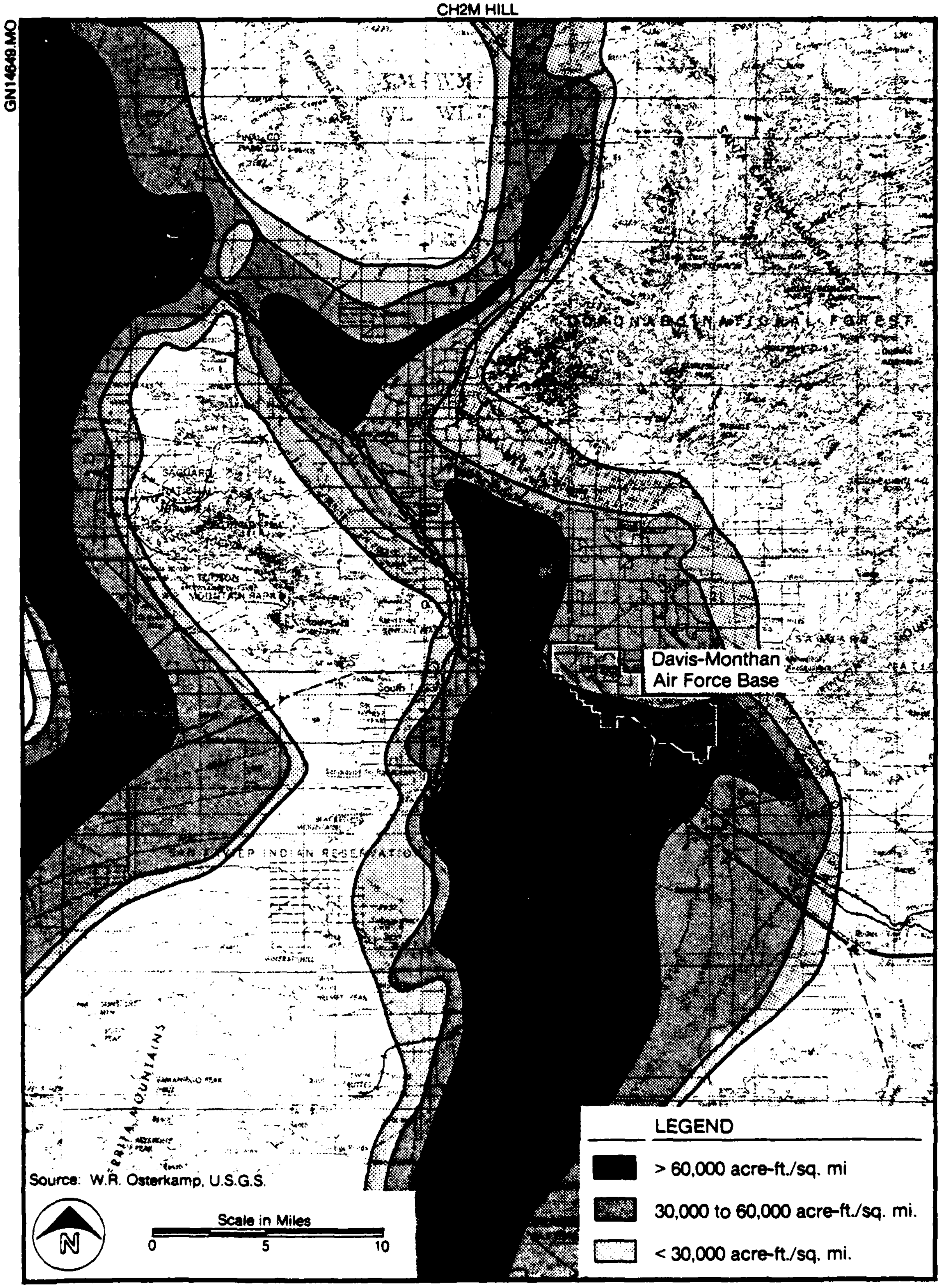

FIGURE 11. Distribution of recoverable ground water.

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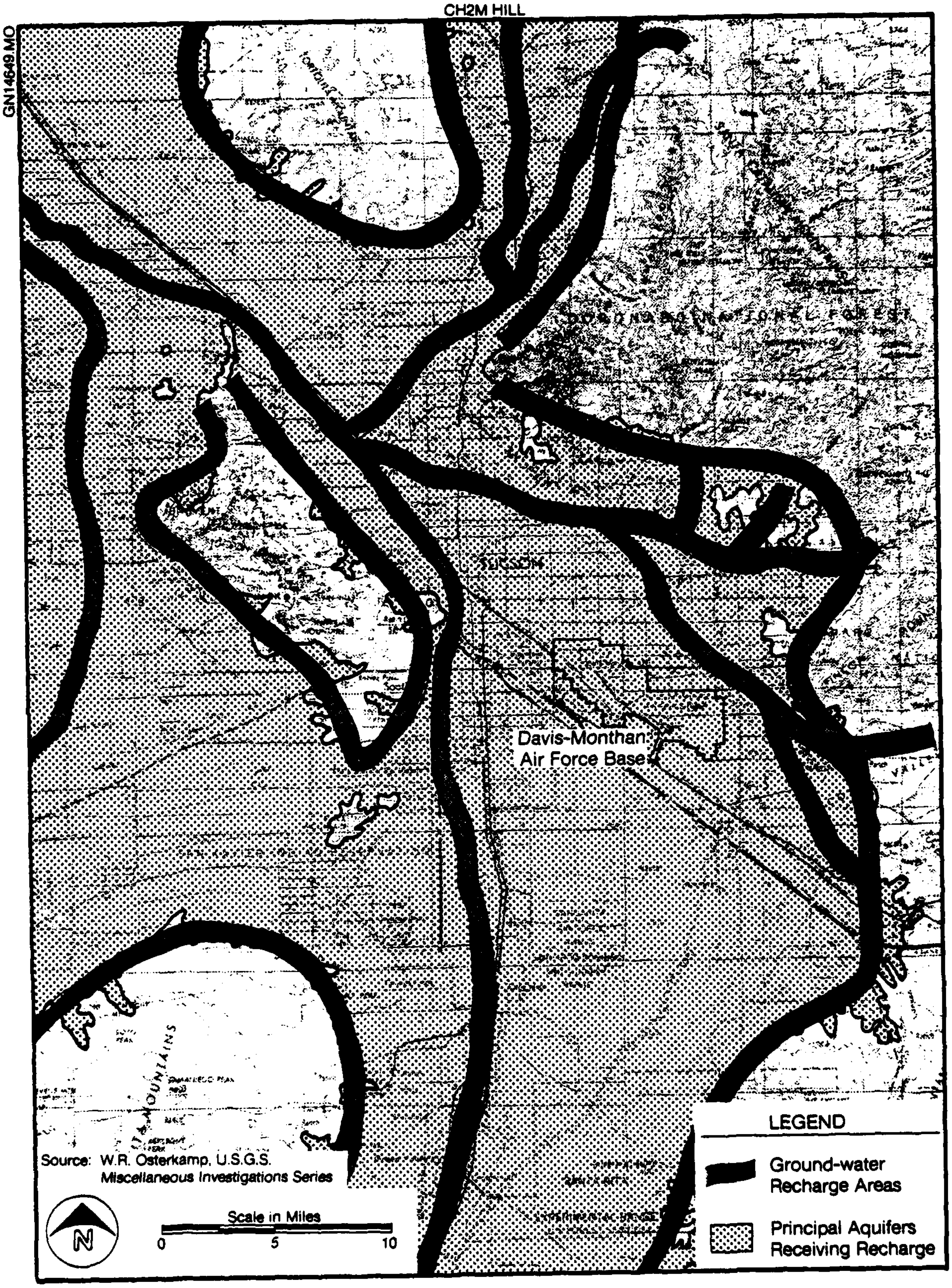

FIGURE 12. Ground-water recharge areas.

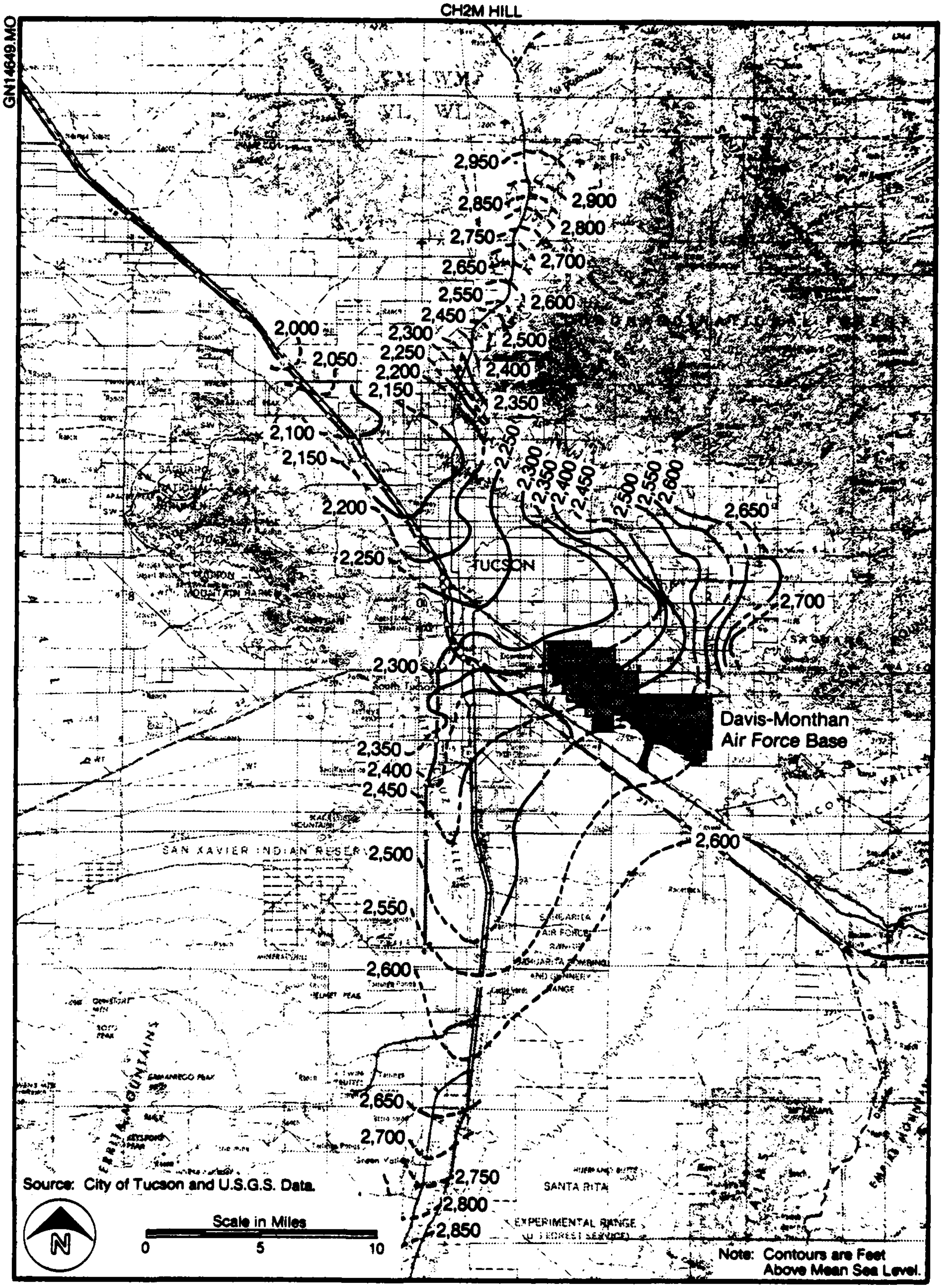

FIGURE 13. Ground-water elevation map.

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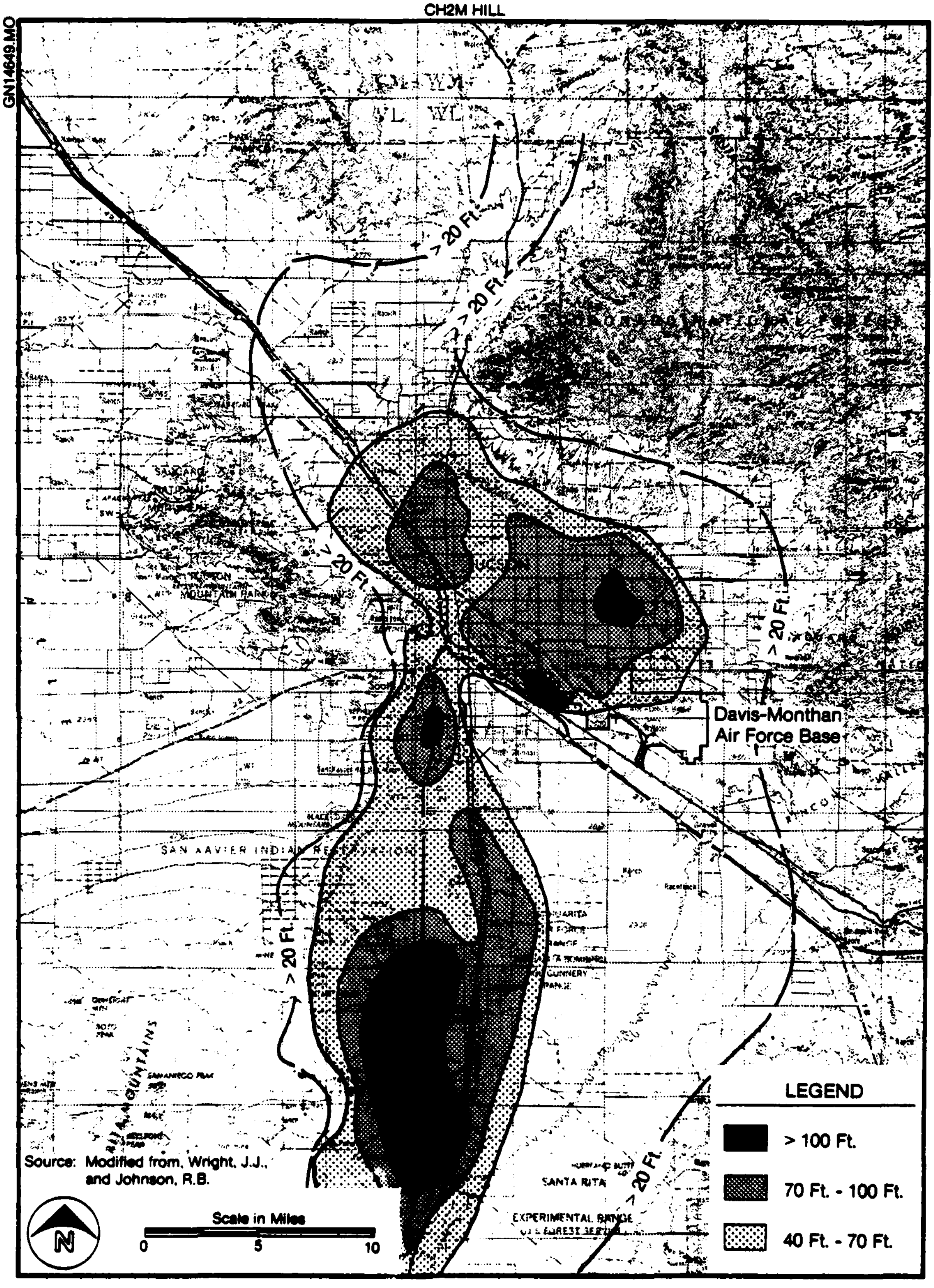

FIGURE 14. Ground-water decline (1947-1975).

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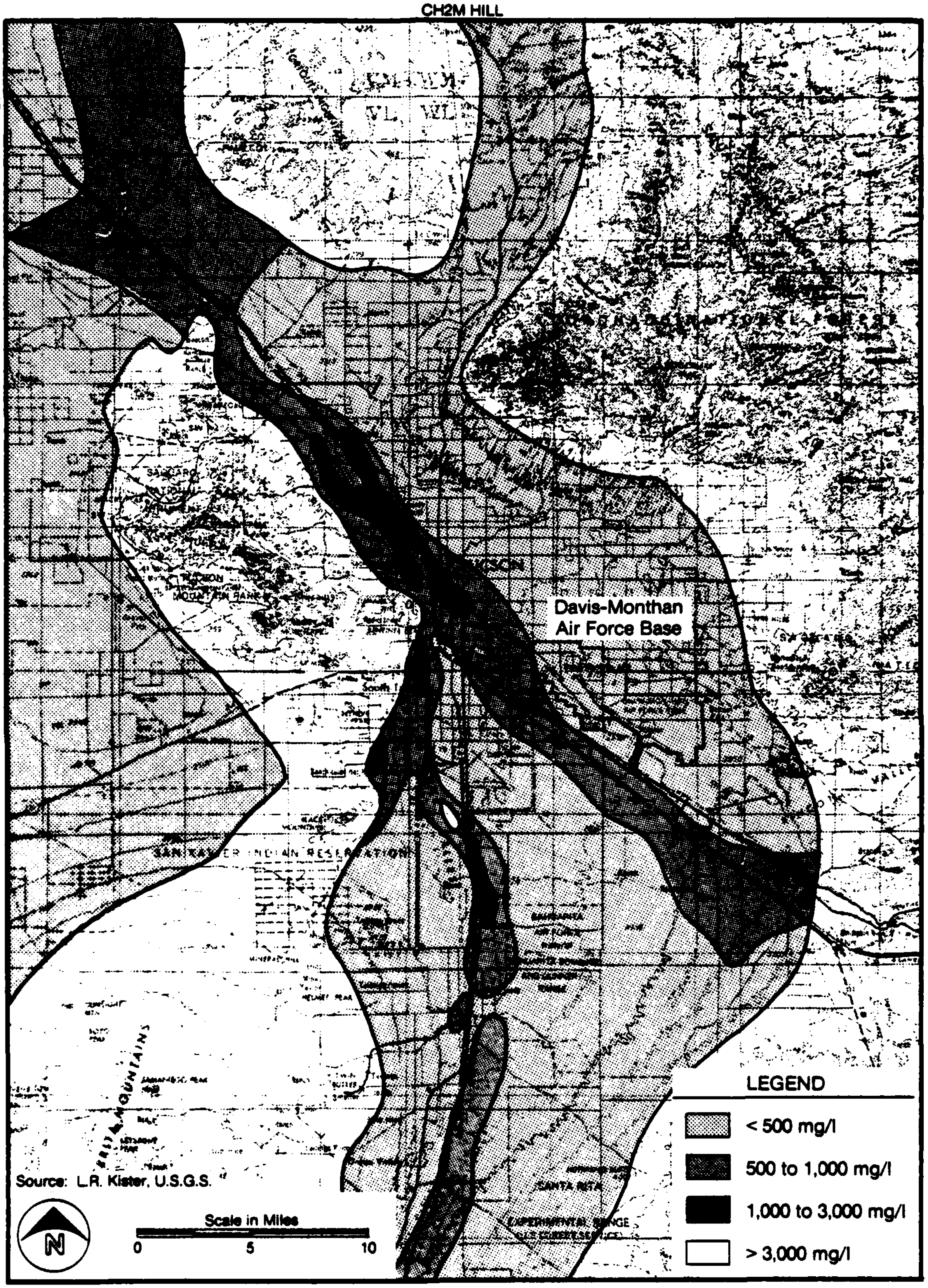
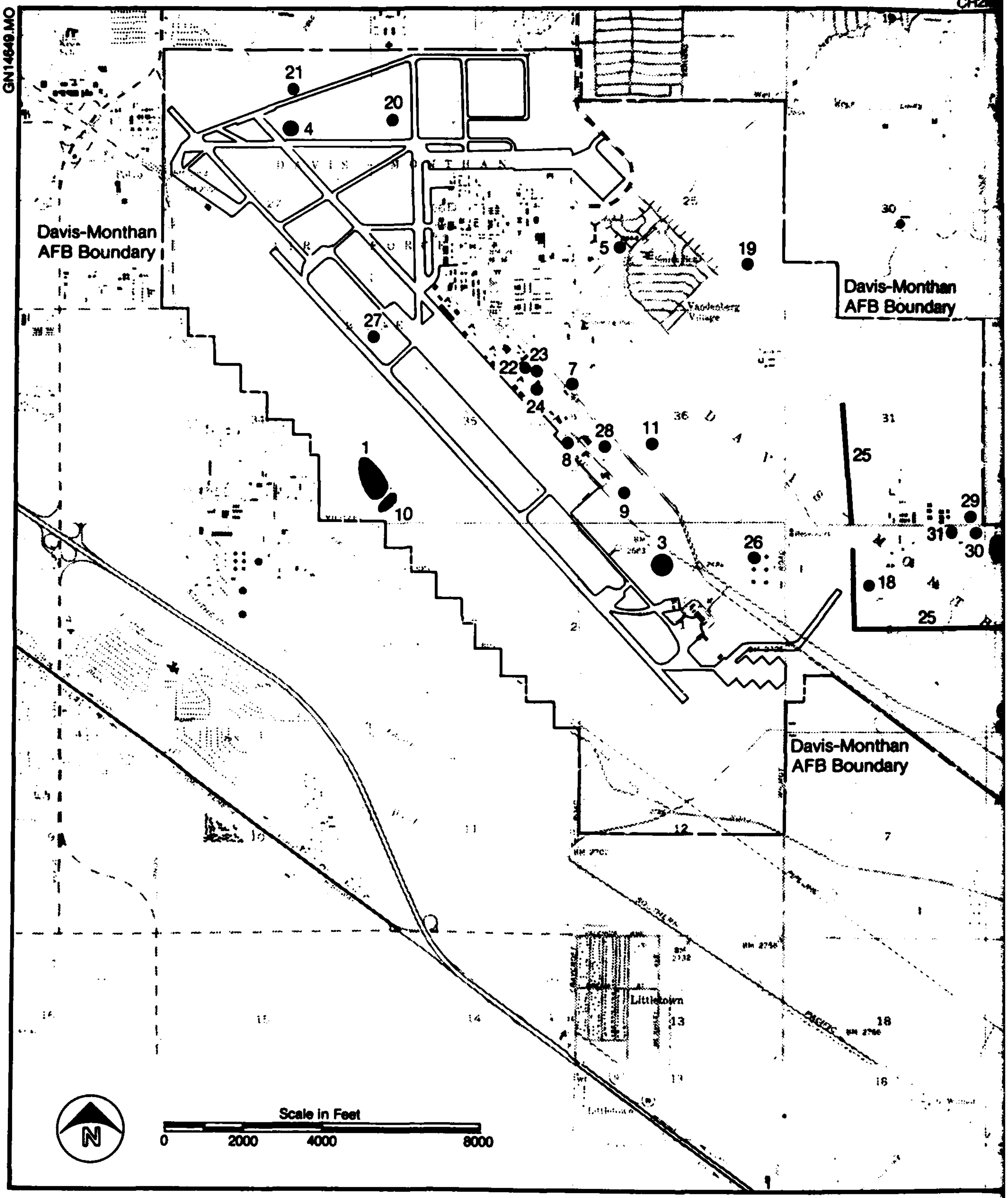


FIGURE 15. Dissolved solids content in ground water.



Location map of identified disposal and

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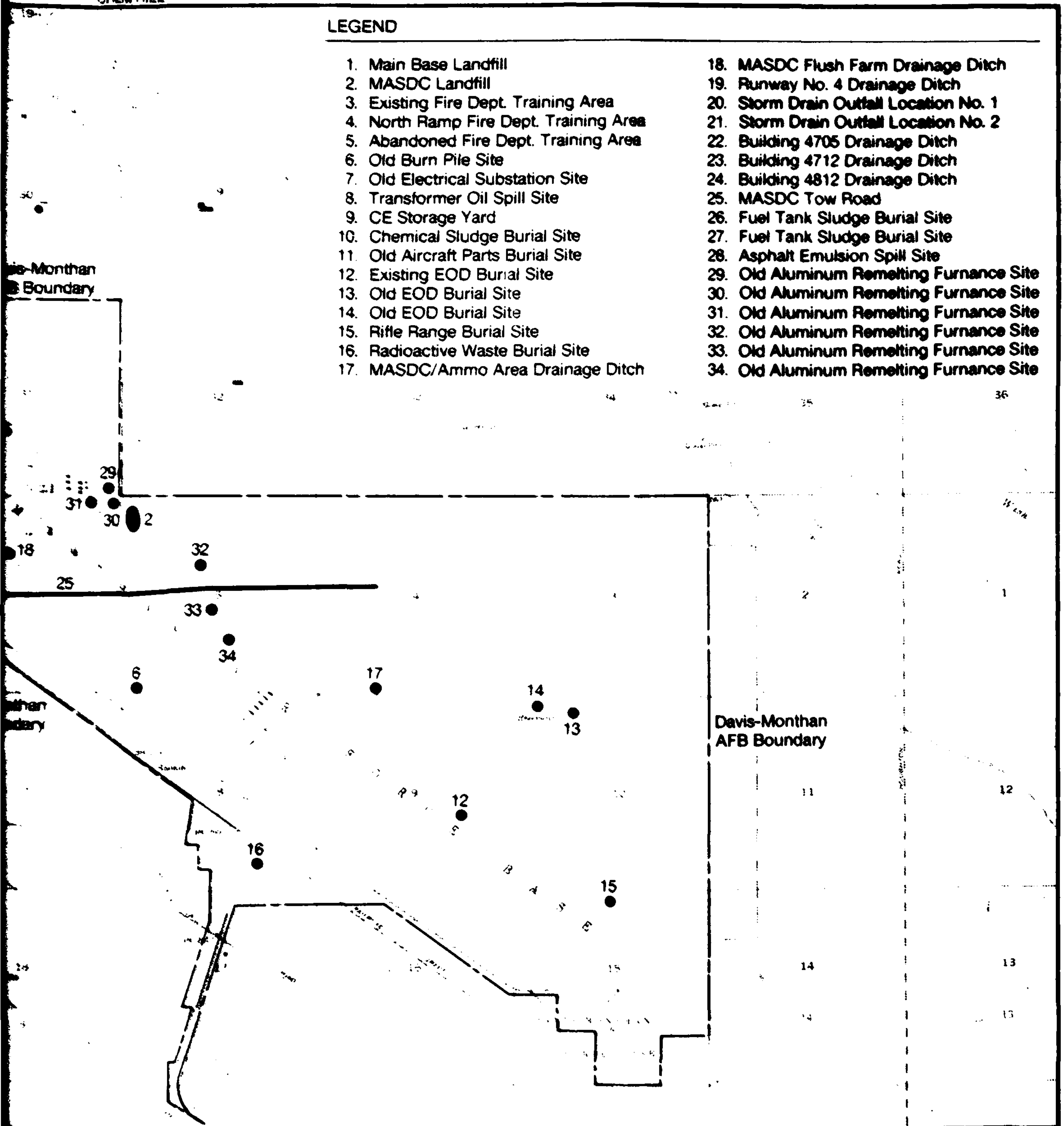

d disposal and spill sites at Davis-Monthan AFB. **FIGURE 16.**

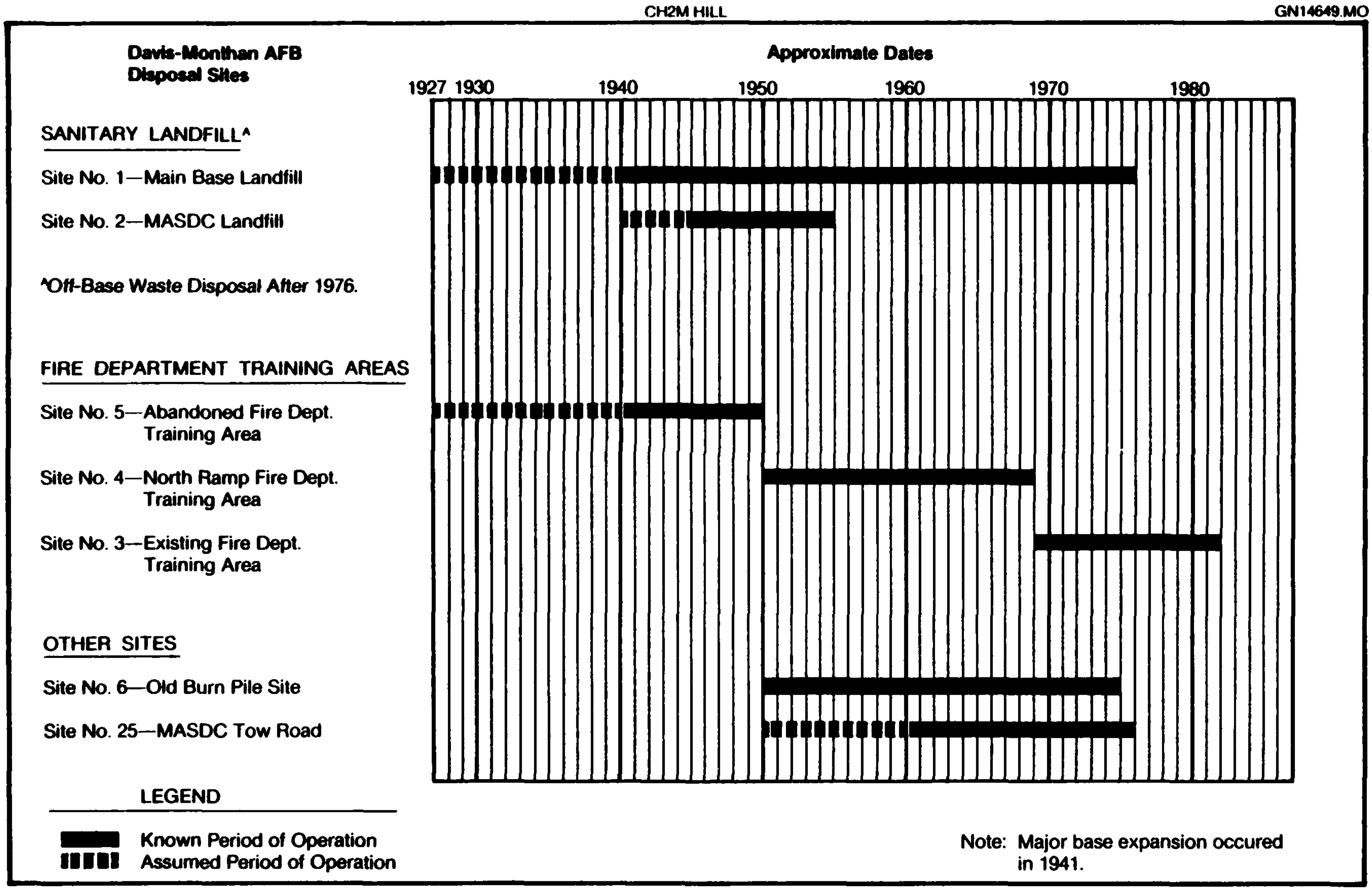

FIGURE 17. Historical summary of activities at major disposal sites at Davis-Monthan AFB.

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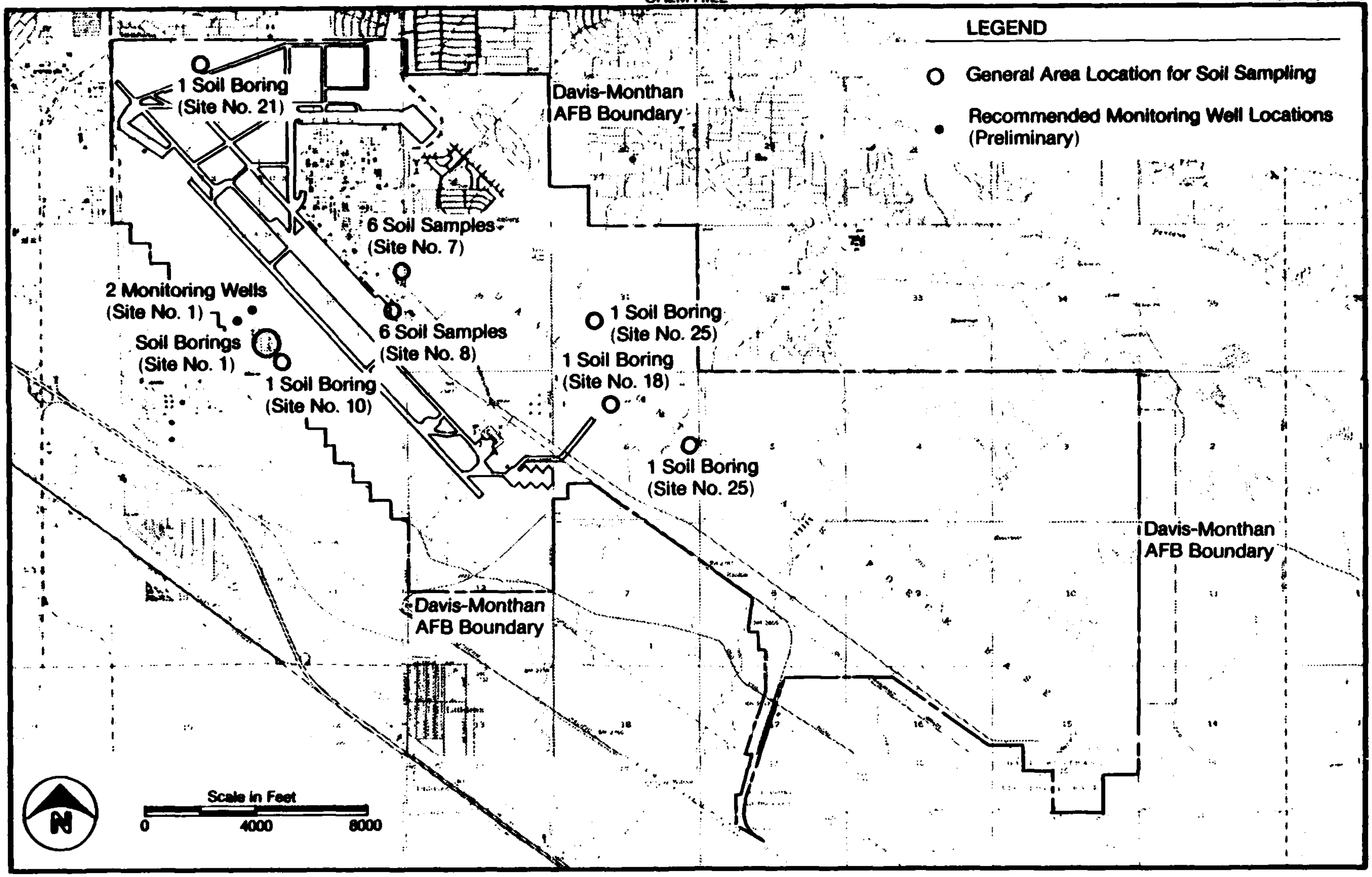

FIGURE 18. Preliminary recommended monitoring well and soil sampling locations at Davis-Monthan AFB.

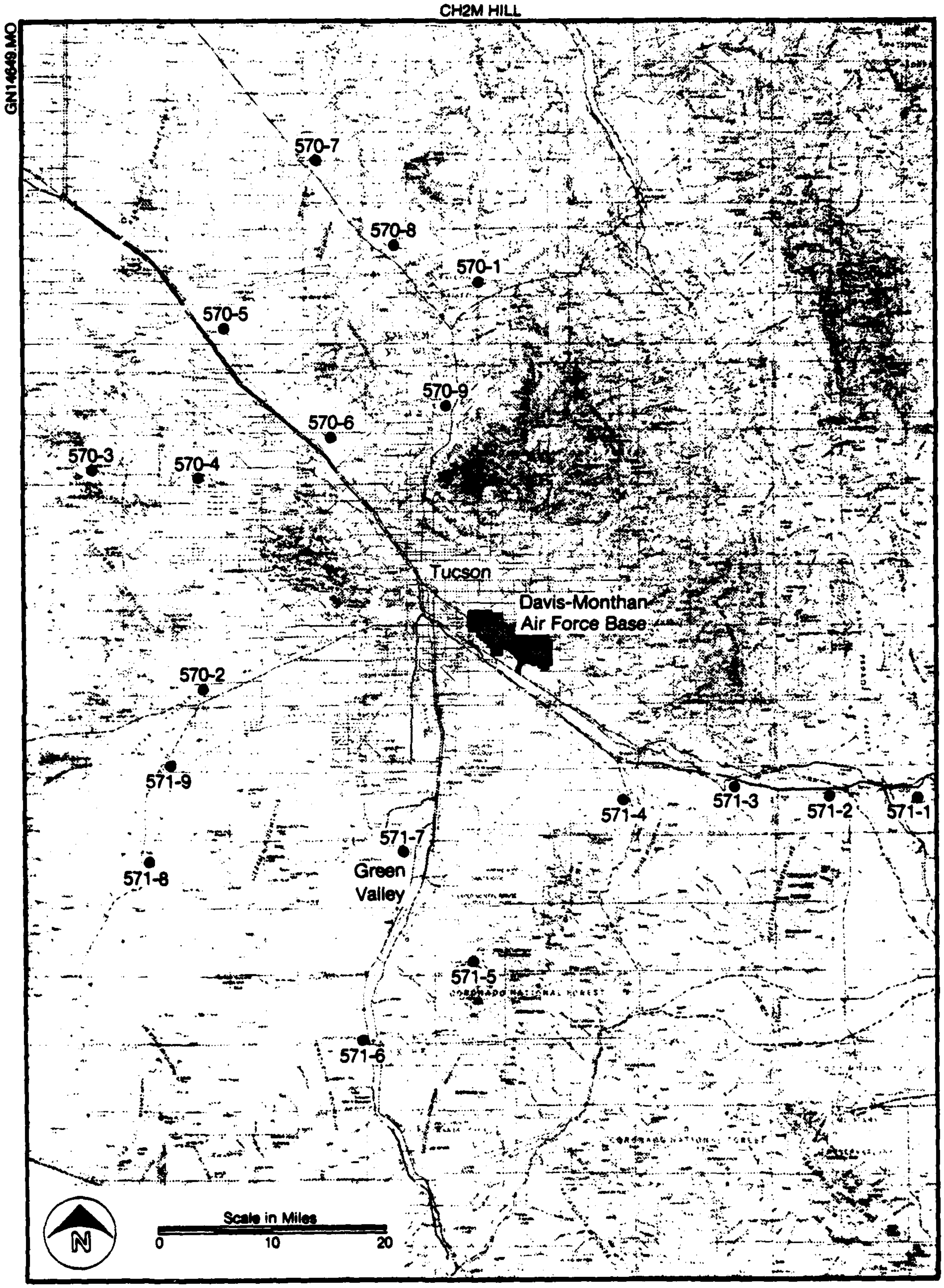

FIGURE 19. Location map of Titan Missile Sites.

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M.S., Analytical Chemistry, University of Florida, 1972
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Experience

Mr. Hatch joined CH2M HILL in 1973 and is currently the Manager of the Industrial Wastewater Reclamation Department. His range of engineering experience includes hazardous waste projects, laboratory and pilot treatability studies, process design of industrial wastewater treatment facilities, and process design of municipal water and wastewater treatment facilities. Examples of his work include:

- Overall responsibility for hazardous materials disposal site records searches for 12 U.S. Air Force installations throughout the United States. The purpose of the records searches is to assess the potential for hazardous contaminant migration from past disposal practices and to recommend follow-up actions.

- Assistance in a comprehensive RCRA compliance program for Gulf Oil Company's Port Arthur Refinery.

- Project manager of a feasibility study for treatment of high nitrogen industrial wastewater from the Air Products and Chemicals, Inc., manufacturing facility in Pensacola, Florida. Treatment technologies investigated included aerated lagoons, oxidation ponds, anaerobic treatment ponds, spray irrigation, activated carbon, and air stripping.

- Project manager of a comprehensive treatability and process selection study for the American Cyanamid Fibers Division plant in Milton, Florida. Investigations included spray irrigation, deep well injection, activated sludge, rotating biological contactors, anerobic contact treatment, activated carbon, ion exhange, and chemical coagulation.

- Project manager for several other treatability and process selection studies for industrial clients including Arizona Chemical Company, Kaiser Agricultural Chemicals, Engelhard Industries, and Production Plating Company.

- Assistance in the negotiation of NPDES permits for Air Products and Chemicals, Inc., American Cyanamid, and Kaiser Agricultural Chemicals.

- Lead engineer on an ozone disinfection feasibility study for the City of Philadelphia's Queen Lane Water Treatment Plant. Also served as chief process engineer for the subsequent design of chemical feed systems at the Queen Lane Plant.

NORMAN N. HATCH, JR.

- Process design and design of chemical feed and sludge handling facilities for the Alexander City, Alabama, Water Treatment Plant.
- Process design and design of chemical feed system modifications for the St. Augustine, Florida, Water Treatment Plant.
- Project manager for the design of water treatment facilities, including lime softening, zeolite softening, and granular activated carbon adsorption for a sugar mill in south Florida.
- Project manager for development of a comprehensive water system master plan, including raw water supply, treatment, and distribution systems for the Fort Pierce Utilities Authority, Fort Pierce, Florida.
- Project manager for a feasibility study of direct wastewater reuse for potable water for the City of St. Petersburg, Florida.
- Project manager for the planning, supervision, and performance of pilot plant investigations for the removal of hydrogen sulfide from potable water for the Orlando Utilities Commission, Orlando, Florida.
- Cost-effective analysis and process selection for treatment of combined domestic and paper mill wastewater for the City of Harriman, Tennessee.
- Preparation of various segments of 201 facilities plans for Monroe County (Florida Keys); Lake City, Florida; Alachua County, Florida; Puerto Rico; and Live Oak, Florida.

Before joining CH2M HILL, Mr. Hatch was employed with the E.I. du Pont de Nemours Photo Products Plant in Parlin, New Jersey.

Membership in Organizations

Phi Beta Kappa
Phi Kappa Phi
Society of the Sigma Xi
Water Pollution Control Federation

Professional Engineer Registration

Florida
Georgia

GREGORY T. MCINTYRE
Environmental Engineer

Education

M.S., Environmental and Water Resources Engineering, Vanderbilt University, 1981
B.S., Environmental Engineering, University of Florida, 1980

Experience

Mr. McIntyre's responsibilities at CH2M HILL involve projects dealing with laboratory and pilot treatability studies, industrial waste treatment processes, and hazardous wastes. Since joining the firm in September 1981, his project-related assignments have included:

- Participation in wastewater characterization, laboratory pilot plant treatability study, evaluation of existing pretreatment, and conceptual design for equalization and aerobic biological treatment of industrial wastewater for Hercules, Inc.

- Hazardous materials disposal site records search for the U.S. Air Force to assess the potential for hazardous contaminant migration from past disposal practices and to recommend follow-up actions.

While in graduate school working as a research assistant, some of Mr. McIntyre's activities included:

- Researching the removal of heavy metals, including copper, zinc and trivalent chromium, using a large-scale adsorbing colloid foam flotation pilot plant.

- Experimental verification of the mathematical model of a continuous flow flotation column.

Professional Registration

E.I.T., Florida

Membership in Organizations

American Water Works Association
Water Pollution Control Federation
Tau Beta Pi

Publications

"Inexpensive Heavy Metal Removal By Foam Flotation." (Coauthors E. L. Thackston, J. J. Rodriguez, and D. J. Wilson). *Proceedings of the 35th Annual Purdue Industrial Waste Conference*, May 1981. *Proceedings of the International Conference on Heavy Metals in the Environment*, Amsterdam, September 1981. *Proceedings of the 2nd Mediterranean Congress of Chemical Engineering*, Barcelona, Spain, October 1981.

GREGORY T. MCINTYRE

"Copper Removal by an Adsorbing Colloid Foam Flotation Pilot Plant." (Coauthors E. L. Thackston, J. J. Rodriguez, and D. J. Wilson). *Separation Science and Technology*. (In Press)

"Experimental Verification of the Mathematical Model of a Continuous Flow Flotation Column." (Coauthors J. E. Kiefer, J. J. Rodriguez, and D. J. Wilson). *Separation Science and Technology*. (In Press)

"Pilot Plant Study of Copper, Zinc, and Trivalent Chromium Removal by Adsorbing Colloid Foam Flotation." M.S. Thesis, Vanderbilt University, 1981.

GARY E. EICHLER
Hydrogeologist

Education

M.S., Engineering Geology, University of Florida, 1974
B.S., Construction and Geology, Utica College of Syracuse University, 1972

Experience

Mr. Eichler has been responsible for ground-water projects for both water supply and effluent disposal. Studies have included site selection, well design, construction services, monitoring and testing programs, determination of aquifer characteristics, and well field design. In addition, Mr. Eichler has conducted numerous studies to determine pollution potential of toxic and hazardous wastes. Types of projects for which Mr. Eicher has been directly responsble for include:

- Exploration drilling, testing, and design of well fields for potable water supply with an installed capacity of over 65 mgd.
- Determination of pollutant travel time and direction of movement at hazardous waste disposal sites.
- Geophysical logging and testing programs for deep disposal wells for both municipal and hazardous waste.
- Aquifer modeling studies completed to predict effects of future ground-water withdrawal.
- Determination of saltwater intrusion potential and design of associated monitoring programs.

Prior to joining CH2M HILL in 1976, Mr. Eichler was an engineering geologist with Environmental Science and Engineering, Inc., of Gainesville, Florida. Responsibilities there included project management, soils investigations, siting studies, ground-water and surface-water reports, and Federal and state environmental impact studies. He has professional capabilities in the following areas.

- Hydrogeology. Water supply well location, aquifer testing, well field layout, injection well testing and monitoring program design, and well construction inspection.
- Water resources inventory. Potentiometric mapping, water yield, and availability determinations.
- Site investigations. Determination of subsurface conditions, primarily in soil media. Determination of stratigraphic correlation and associated physical properties for engineering design.
- Environmental permitting. Federal, state, regional, and local permit studies associated with industrial and mining projects.

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GARY E. EICHLER

- Clay mineralogy. Clay mineral reactions primarily associated with lime stabilization for highways and other engineering projects. Participated in a Brazilian highway project and developed laboratory analysis for lime-soil reactions.

- Engineering geology. Geologic exploration, soil property determinations for engineering design, and water and earth materials interactions associated with construction.

- Geophysics. Well logging and interpretation.

Mr. Eichler directed the laboratory analysis of tropical soils to determine engineering properties and reaction potential with lime additives for a Brazilian highway project. He also assisted in the preparation and presentation of a seminar on lime stabilization sponsored by the National Lime Association.

Membership in Organizations

American Institute of Professional Geologists
American Water Resources Association
Association of Engineering Geologists
Geological Society of America
Southeastern Geological Society
National Water Well Association

Publications

Engineering Properties and Lime Stabilization of Tropically Weathered Soils. M.S. thesis, Department of Geology, University of Florida. August 1974.

Certifications

Certified Professional Geologist
Certificate No. 4544

ROBERT L. KNIGHT
Ecologist

Education

B.A., Zoology, University of North Carolina, 1970
M.S.P.H., Environmental Chemistry and Biology, University of North Carolina, 1973
Ph.D., Systems Ecology, University of Florida, 1980

Experience

Dr. Knight's responsibilities at CH2M HILL involve all aspects of environmental study, including design and implementation of field studies, data analysis and interpretation, project management, environmental systems overview analysis, impact analysis, prediction, and assessment. His experience has covered a wide range of applied research problems in aquatic and terrestrial environments, including computer simulation analyses. Representative experience includes the following:

- Crystal River Power Plant Study—Managed and participated in field study of the effects of nuclear power plant operation on Crystal River estuarine metabolism.

- Heavy Metal Toxicity Studies—Participated in design and implementation of long-term studies of fate and effects of cadmium and mercury at low levels in stream microcosms. Prepared toxicity simulation model for cadmium and developed general quantification techniques of toxicity in biological systems.

- Environmental Systems Overview Analysis—Prepared and simulated quantitative overview models for Coosa River EIS and for Indian River Power Plant impacts.

- Silver Springs Study—Performed extensive field work at Silver Springs, Florida, to investigate the relationship between plant productivity and consumer organisms. Developed new microcosm design for study of flowing aquatic systems.

- Wetland Waste Assimilation Studies—Conducted feasibility and research studies on the use of natural and artificial wetlands for assimilation of domestic wastewaters. Wetland systems include *Spartina* salt marshes in North Carolina, hardwood swamp and prairie wetlands in Florida, and pocosin systems in South Carolina.

- Hazardous Waste Studies—Assessed environmental impacts of hazardous waste disposal at a number of Air Force bases, nationwide.

- Phytoplankton Research—Performed field verification studies of Algal Assay Procedure. Studied effects of power plant entrainment on phytoplankton numbers and diversity. Provided enumeration and taxonomy of Suwannee River phytoplankton.

ROBERT L. KNIGHT

Publications

Dr. Knight has authored several technical papers on ecosystem metabolism, phytoplankton ecology, and heavy metal dynamics in aquatic systems. Representative papers include:

"In Defense of Ecosystems," (Coauthor D. Swaney). *American Naturalist*, 117:991-992, 1981.

"A Control Hypothesis for Ecosystems—Energetics and Quantification with the Toxic Metal Cadmium." In: W. Mitsch, R. W. Bosserman, and J. M. Klopatek (eds.) *Energy and Ecological Modelling*. Elsevier Publishing Co. pp. 601-615, 1981.

Record of Estuarine and Salt Marsh Metabolism at Crystal River, Florida, 1977-1981, (Coauthor W. F. Coggins). Final Summary Report to Florida Power Corporation, Dept. of Environmental and Engineering Sciences, University of Florida, Gainesville. 1982.

"Large-Scale Microcosms for Assessing Fates and Effects of Trace Contaminants," (Coauthors J. W. Bowling, J. P. Giesy, and H. J. Kania). In: J. P. Giesy (ed.) *Microcosms in Ecological Research*, USDE pp. 224-247, 1980.

"Fates of Cadmium Introduced into Channel Microcosms," (Coauthors J. P. Giesy, J. W. Bowling, H. J. Kania, and S. Mashburn). *Environment International*, 5:159-175, 1981.

Energy Basis of Control in Aquatic Ecosystems. Ph.D. Dissertation, University of Florida. 1980.

Energy Model of a Cadmium Stream with Correlation of Embodied Energy and Toxicity Effect. Final Report to EPA on Contract EPA R-806080. 1980.

Fate and Biological Effects of Mercury Introduced into Artificial Streams. (Coauthors H. J. Kania and and R. J. Beyers). EPA-600/3-76-060. U.S. EPA, Athens, Georgia. 1976.

Effects of Entrainment and Thermal Shock on Phytoplankton Numbers and Diversity. Department of Environmental Sciences and Engineering, Publication 336, University of North Carolina, Chapel Hill. 1973.

Appendix B
OUTSIDE AGENCY CONTACT LIST

1. Arizona Commission of Agriculture and Horticulture, District Office
   Tucson, Arizona
   Mr. Kenneth Bolton
   602/628-5396

2. United States Fish and Wildlife Service, Endangered Species Program
   Phoenix, Arizona
   Mr. Jerry Burton
   602/241-2487

3. Arizona Natural Heritage Program--The Nature Conservancy
   Tucson, Arizona
   Mr. Terry Johnson
   602/323-1857

4. Arizona Game and Fish Commission, Tucson Office
   Tucson, Arizona
   Ms. Vashti Supplee
   602/628-5376

5. Arizona Department of Water Resources--Basic Data Unit
   2810 South 24th Street, Phoenix, Arizona
   Mr. Bill Remick
   602/255-1543

6. Arizona Department of Health Services, Bureau of Waste Control, Hazardous Waste Division
   1740 West Adams Street, Phoenix, Arizona
   Mr. Bill Williams
   602/255-1160

7. Arizona Department of Health Services, Water Quality Division
Phoenix, Arizona
Mr. Lindon Hammond
602/155-1258

8. Environmental Protection Agency, Region IX, Hazardous Materials Branch
San Francisco, California
Mr. Fred Hoffman
415/974-8191

9. Arizona Department of Health Services, Tucson Office
Tucson, Arizona
Mr. Jack Lindeman, Mr. Steven DeVereaux
602/628-5321

10. U.S. Geological Survey
301 West Congress Street
Tucson, Arizona
Ms. Natalie White, Mr. Larry Mann
602/792-6671

11. U.S.D.A. Soil Conservation Service
3241 North Romero Road
Tucson, Arizona
Mr. Cris Cochron
602/792-6602

12. Water Quality Control Board
402 West Congress Street
Tucson, Arizona
Mr. Steve DeVereaux
602/792/6602

13. City of Tucson Water Department
111 East Pennington
Tucson, Arizona
Mr. Gary Hix, Mr. Bruce Johnson
602/791-4761

14. Arizona Department of Water Resources
371 South Myer
Tucson, Arizona
Ms. Kathy Jacobs, Mr. Dave Esposito
602/628-5858

15. Pima Association of Governments
Transamerican Title Building
West Alemeda
Tucson, Arizona
Mr. Frank Postillion

Appendix C
DAVIS-MONTHAN AFB RECORDS SEARCH INTERVIEW LIST

Interviewee	Area of Knowledge	Years at Installation
1	Civil Engineering	14
2	Solid Waste Disposal	14
3	Environmental Coordination	2
4	MASDC	29
5	MASDC	26
6	MASDC	25
7	Operations and Maintenance	19
8	Exterior Electric	21
9	Mt. Lemmon/Paint Shop	26
10	Bioenvironmental Engineering	1
11	Bioenvironmental Engineering	3
12	Judge Advocate Office	1
13	Liquid Fuels Management	1
14	Liquid Fuels Maintenance	8
15	DPDO	20
16	DPDO	15
17	Fire Department	1
18	Fire Department	5
19	Fire Department	16
20	Water and Wastewater	17
21	Plumbing Shop	28
22	Equipment Operator	13
23	Equipment Operator	11
24	MASDC	39
25	Base Supply	16
26	Electric Shop	20
27	Titan Missiles	13
28	Real Property	3
29	Entomology	12
30	Plumbing Shop	16
31	EOD	4
32	Titan Missile Maintenance	15
33	Environmental Coordination	14
34	Pavements and Grounds	4
35	Bioenvironmental Engineering	6
36	MASDC	32
37	MASDC	12
38	MASDC	37
39	MASDC	5
40	MASDC	19
41	MASDC	17
42	MASDC	17
43	MASDC	35
44	MASDC	17
45	MASDC	1
46	MASDC	20
47	Bioenvironmental Engineering	3
48	Civil Engineering	5
49	Titan Missile Site	2
50	Titan Missile Maintenance	5

Appendix D

INSTALLATION HISTORY

Davis-Monthan AFB is the outgrowth of the original municipal airport established by the citizens of Tucson in 1919. The base is named after two Air Corps officers, Samuel H. Davis and Oscar Monthan, both of whom were killed in military accidents. Various construction programs were initiated between 1927 and 1937. The Army Air Corps constructed the first steel and concrete hangar in 1931. Modern paved roads and runways were provided by Federal relief projects from 1934 through 1937. After the attack on Pearl Harbor in 1941, the base was improved as a heavy bombardment training station. In October 1945, the last B-29 Super Fortress Unit was deactivated and the base became nearly deserted. The base was designated an Air Technical Service Command Storage Area in 1945 and a large portion of the base is still allocated to the Air Force Logistics Command (AFLC) for aircraft storage, reclamation, and disposal operations.

Davis-Monthan AFB has achieved various milestones since the early post-war years. In 1960, the base was selected as the site of the first operational Titan II ICBM Missile Wing. In 1966, the 100th Strategic Reconnaissance Wing was designated. The 100th Strategic Reconnaissance Wing and its U-2 aircraft remained at Davis-Monthan until 1976 when the Wing moved to Beale AFB, California. In 1971, the 355th Tactical Fighter Wing was reactivated. In 1976, after serving as a Strategic Air Command Base for 30 years, Davis-Monthan became a Tactical Air Command Base. In 1979, the 355th Tactical Fighter Wing was renamed the Tactical Training Wing. On January 1, 1981, the 836th Air Division was established at Davis-Monthan AFB.

Primary Mission

The 836th Air Division is responsible for the administrative, medical, and logistical support of all assigned units and also supervises training of combat air crews worldwide. The 836th Air Division commands the 355th Tactical Training Wing, the 836th Combat Support Group, Resource Management, and the Davis-Monthan Hospital. These host organizations and their missions are described below:

355th Tactical Training Wing - The mission of the 355th Tactical Training Wing is combat training and readiness to deploy on short notice to any place in the world where tactical airpower is needed. The 355th is equipped with a subsonic jet aircraft (A-10) especially suited for close air support for ground combat troops.

Resource Management - This unit combined the major base resources under one manager, the Deputy for Resource Management. It includes the functions of accounting and finance, procurement, supply, transportation, and plans.

836th Combat Support Group - This organization provides the housekeeping and service functions vital to the operation of the base. Among its units are administration, personnel, disaster preparedness, civil engineering, food service, legal, security police, and the chapel.

Davis-Monthan Hospital - The modern 100-bed hospital provides broad medical coverage for active duty and retired military families in the Tucson area. In addition to a 24-chair dental clinic, services are also provided in pediatrics, optometry, psychiatry, and physical examinations.

Tenant Mission

The major tenants at Davis-Monthan AFB and their missions are summarized below:

390th Strategic Missile Wing - This Wing's deterrent weapon, the Titan II intercontinental ballistic missile, is important to the Strategic Air Command mission of deterring aggression. The Wing's mission is that of contributing to the credibility of SAC and all United States' nuclear strike forces. The 390th maintains a ready force of nuclear weapons which represent a deterrrent to any potential aggression against the United States.

23rd Tactical Air Support Squadron - The mission of the 23rd TASS is to provide Tactical Air Control Ground parties capable of air strike control and liaison in direct support of U. S. Army forces.

Military Aircraft Storage and Disposition Center (MASDC) - This tenant provides a centralized point of reserve air power for all the military services. Attached to the Air Force Logistics Command, it is the single operating agency of the USAF for the storage, reclamation, return to flyable status, and disposition of all aircraft not immediately required in the operational inventory of the Department of Defense. MASDC has an aircraft inventory of some 70 different models and over 5,500 airplanes. The center annually processes more than 1,000 aircraft into storage and disposes of about the same quantity.

5th Fighter Interceptor Squadron - Operates and maintains F-106 aircraft on alert status for interception of hostile aircraft.

<u>1903d Communications Squadron</u> - Provides air traffic control service and maintains navigational aids for Davis-Monthan Air Force Base.

<u>390th Communications Squadron</u> - Provides communications support for the 390th Strategic Missile Wing.

<u>4444th Operations Squadron</u> - This unit is responsible for developing the training program for weapons systems and for improving on the methods of training for these systems.

<u>Air Force Audit Agency</u> - The Resident Auditor's mission is to examine and appraise policies, procedures, records, and reports which relate to programming, budgeting, accounting, finance, procurement, supply, and all other fund-spending activities to ensure positive control.

<u>Air Force Office of Special Investigation, Detachment 1703</u> - Responsible for providing criminal, counter-intelligence, personnel security, and special investigative services for all Air Force activities.

<u>Detachment 1, 37th Air Rescue and Recovery Squadron</u> - The mission of Detachment 1, 37ARRS at Davis-Monthan AFB is to provide helicopter airlift support for missile activities, disaster control operations to include search and medical evacuation, and rescue operations in support of the base rescue program.

<u>Detachment 13, 25th Weather Squadron</u> - The primary mission of Detachment 4, 3rd Weather Squadron is to provide weather support to local flying units, as well as to provide weather information for all parts of the world where American military aircraft may operate.

<u>Detachment 17, 4400th Management Engineering Squadron</u> - The mission of the TAC Management Engineering Team is the

development and application of managerial tools, techniques, methods, and procedures to ensure optimum economic use of manpower resources.

83rd Tactical Control Flight - The mission of the 83rd Tactical Control Facility is to provide highly mobile, lightweight radar units employed as a forward air control post, to provide surveillance and control dissemination of air movement data in its area of responsibility.

512th Field Training Detachment - Detachment 512, Field Training Detachment's mission is to provide onsite technical services on the A-10, and EC-130 aircraft and associated equipment. The Detachment trains both aircrews and maintenance personnel.

FAA Radar Approach Control Facility - The mission of the Federal Aviation Administration's Radar Approach Facility is to provide air traffic control for all air traffic in the Tucson, Arizona area, including Davis-Monthan AFB.

U. S. Customs Air Support Branch - The primary mission is to interdict aircraft smuggling contraband into the United States. Their secondary mission is to provide air support for other customs entities and thirdly, enforcement support for other federal, state, and local entities.

41st Electronic Combat Squadron - The mission of the 41st Electronic Combat Squadron is to conduct, command, and control communications countermeasures in support of tactical forces.

868th Tactical Missile Training Squadron - The mission of the 868th Tactical Missile Training Squadron is to train Air Froce personnel to operate and maintain the Ground Launched Cruise Missile System.

Appendix E
MASTER LIST OF INDUSTRIAL ACTIVITIES

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment/Storage/Disposal Methods
355th CES					
Structural Shop	--	--			
Entomology Shop	5142 1968-Pres.	--	X	X	Consumed in use; rinsed cans to dumpster
Exterior Electric Shop	5122 1942-Pres.	--	X		Consumed in use
Fire Protection Branch	--	--	X		
Grounds Maintenance	5122 1942-Pres.	--			
Heating Shop	5211 1944-Pres.	--			
Heavy Equipment Shop	--	--			
Hospital Heating Plant	401 1961-Pres.	--	X		Consumed in use
Interior Electric	5122 1942-Pres.	--	X		Consumed in use
Liquid Fuels Maintenance	5208 1943-Pres.	--	X		
Metal Shop	5208 1943-Pres.	--			
Paint Shop	5122 1942-Pres.	--	X	X	DPDO
Pavements Shop	5122 1942-Pres.	--			
Plumbing Shop	5316 1942-Pres.	--			
Power Production	5122 1942-Pres.	--	X	X	DPDO
Refrigeration & Air Conditioning	--				
Water Shop	--	--			
MASDC					
Powered/Non-Powered AGE Shop	7222 1971-Pres.	Runway 4ª 1946-1971	X	X	DPDO; flush farm waste POL tank
Support Branch	--	--	X	X	DPDO
Avionics Shop	7303 1968-Pres.	Runway 4 1946-1968			
Corrosion Control	7425 1970-Pres.	Runway 4 1946-1970	X	X	Oil/water separator
Crating Unit/Woodmill Shop	--	--			
Egress/Environmental Shop	7302 1968-Pres.	Runway 4 1946-1968	X	X	DPDO
Engine Can/Propulsion Shop	7300 1968-Pres.	Runway 4 1946-1968	X	X	DPDO
	7301 1968-Pres.	Runway 4 1946-1968			
	7340 1968-Pres.	Runway 4 1946-1968			
Instruments/Electric Shop	7304 1968-Pres.	Runway 4 1946-1968	X	X	DPDO
NDI Lab	7401 1968-Pres.	Runway 4 1946-1968	X	X	Oil/water separator; DPDO
Paint Shop	7326 1968-Pres.	Runway 4 1946-1968	X	X	DPDO
Parachute/Fabric Shop	--	--			
Parts Preservation & Packaging Shop	7401 1968-Pres.	--			
Pneudraulics Shop	7415 1968-Pres.	Runway 4 1946-1968	X	X	DPDO
Preservation Section (Flush Farm)	7448 1968-Pres.	Runway 4 1946-1968	X	X	DPDO; flush farm waste POL tank
Processing Out Section	7401 1968-Pres.	Runway 4 1946-1968	X	X	DPDO
Reclamation Shop (Parts Removal)	7401 1968-Pres.	--	X	X	DPDO; flush farm waste POL tank
Sheet Metal Shop	--	Runway 4 1946-1968			
Small Parts Cleaning Shop	7401 1968-Pres.	--	X	X	DPDO

Appendix E—Continued

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment/Storage/Disposal Methods
836th CSG					
Auto Hobby Shop	3614 1980-Pres.	--	X	X	DPDO
Ceramic Hobby Shop	4465 1958-Pres.	--			
Base Photo Lab	1236 1941-Pres.	--	X	X	Sanitary Sewer
Wood Hobby Shop	4531 1980-Pres.	--			
Small Arms Firing Range	166 1952-Pres.	--	X		Consumed in use
Transportation Squadron					
Battery Shop/Tire Rack/Lube Rack/ Mobile Maintenance Shop	4706 1953-Pres.	--	X	X	DPDO; neutralization to sanitary sewer
General Purpose Vehicle Maintenance Shop	4705 1953-Pres.	--	X	X	DPDO
Packing and Crating	5124 1943-Pres.	--			
Refueling Maintenance	4812 1974-Pres.	--	X	X	DPDO
Special Purpose Maintenance	4705 1953-Pres.	--			
Allied Trades Section	4706 1953-Pres.	--			
USAF Hospital					
Clinical/Pathology Labs	400 1961-Pres.	--	X		
Dental Clinic	400 1961-Pres.	--	X		
Medical Maintenance	412 1961-Pres.	--			
Pathological Incinerator	401 1961-Pres.	--	X		
Radiology	400 1961-Pres.	--	X		
Surgery	400 1961-Pres.	--			
Supply Squadron					
Fuels Laboratory	4858 1982-Pres.	1043 1942-1982	X		
Fuels Management	4857 1972-Pres.	--			
Cryogenics	4861 1958-Pres.	--			
390th MIMS					
Corrosion Control	1540 1960-Pres.	--	X		Consumed in use
Electronic Shop	1540 1960-Pres.	--	X		Consumed in use
RPIE Maintenance Branch	1540 1960-Pres.	--	X	X	DPDO
Recovery Vehicle Maintenance	187 1960-Pres.	--	X	X	DPDO
Pneudraulics Shop	1540 1960-Pres.	--	X	X	DPDO

Appendix E–Continued

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment/Storage/Disposal Methods
Propulsion Shop	1540 1960-Pres.	--	X	X	DPDO
Missile Handling Shop	1540 1960-Pres.	--	X	X	DPDO
Serving (PTS)	1540 1960-Pres.	--	X	X	DPDO
Final Clean Shop	1540 1960-Pres.	--	X	X	Holding tank; neutralization to sanitary sewer
Power Production Shop	1540 1960-Pres.	--	X	X	DPDO
23rd TASS					
AGE Branch	1358 1980-Pres.	1477 1970-1980	X	X	DPDO
Aircraft Generation Branch	1477 1970-Pres.	--	X	X	DPDO
Avionics Branch	1477 1970-Pres.	--			
GEM Vehicle Maintenance	1358 1980-Pres.	--			
Accessories	1440 1941-Pres.	--			
Ground Radio Maintenance	1358 1980-Pres.	--			
Weapons Shop	1246 1967-Pres.	--			
Phase Dock	1447 1970-Pres.	--			
Corrosion Control Shop	1477 1970-Pres.	--	X	X	DPDO; oil/water separator to sanitary sewer
355th CRS					
Electric Shop	5045 1960-Pres.	--			
Environmental Systems Shop	5045 1960-Pres.	--	X	X	DPDO
Instrument Shop	5045 1960-Pres.	--			
Machine Shop	5045 1980-Pres.	5028 1943-1980			
Welding Shop	5045 1980-Pres.	5028 1943-1980			
Autopilot Shop	--	--			
Parachute Shop	4824 1965-Pres.	--			
ECM	--	--			
Sheet Metal Shop	5045 1980-Pres.	5028 1943-1980			
Battery Shop	5045 1960-Pres.	--	X	X	Neutralization to sanitary sewer
HUD	5500 1954-Pres.	--			
Communication/Navigation Shop	5500 1954-Pres.	--			
NDI	5406 1971-Pres.	--	X	X	DPDO
Pneudraulics Shop	5500 1954-Pres.	--			
Propulsion Branch/Engine Shop	5245 1970-Pres.	--	X	X	DPDO
PMEL	1027 1973-Pres.	--			
Sensor/Photo Shop	5500 1954-Pres.	--			
Non-Powered AGE	5245 1970-Pres.	--	X	X	DPDO

Appendix E--Continued

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment/Storage/Disposal Methods
355th EMS					
AGE/Non-Powered AGE	4712 1970-Pres.	--	X	X	DPDO
Armament Shop	4810 1970-Pres.	--	X	X	DPDO
Egress Shop	4824 1955-Pres.	--			
Missile Maintenance Shop	127 1955-Pres.	--			
Repair and Reclamation Shop/Wheel and Tire Shop	4809 1971-Pres.	--	X	X	DPDO
EOD	5420 1953-Pres.	--			
Fuel Systems	5256 1969-Pres.	--			
Transient Maintenance	PB60 --	--			
Corrosion Control	5250 1956-Pres.	--	X	X	DPDO; oil/water separator to sanitary sewer
Phase Branch	1244 1959-Pres.	--			
Munitions Storage Igloos	183 1956-Pres.	--			
Munitions Inspection	265 1959-Pres.	--			
Munitions Line Delivery	4808 1981-Pres.	--			
Munitions Maintenance	190 1956-Pres.	--			
Munitions Trailer Maintenance	183 1956-Pres.	--			
83rd TCF					
AGE Maintenance Shop	8030 1968-Pres.	--	X		
Corrosion Control Shop	8030 1968-Pres.	--	X		
Radar Maintenance Shop	8030 1968-Pres.	--			
Radio Maintenance Shop	8030 1968-Pres.	--			
Refrigeration Shop	8030 1968-Pres.	--			
Vehicle Maintenance Shop	8030 1968-Pres.	--	X		
1903rd Communication Squadron					
Communications Center	3426 1952-Pres.	--			
Radar Maintenance	311 1958-Pres.	--			
Radio Maintenance	4820 1955-Pres.	--			
Navigational Aids	PB-51 --	--			
Weather Maintenance	4820 1955-Pres.				
41st ECS					
Electric/Instrument and Auto Pilot Shop	129 1981-Pres.	--			
AGE Shop	121 1981-Pres.	--			
Flightline Shop	136 1981-Pres.	--			
ECM Shop	129 1981-Pres.	--	X		Consumed in use

Appendix E—Continued

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment/Storage/Disposal Methods
Hydraulic Shop	129 1981-Pres.	--			
Communications/Intertial Navigation System Shops	129 1981-Pres.	--			
Engine Shop	129 1981-Pres.	--			
Fuel Shop	129 1981-Pres.	--	X		Consumed in use
ECS/Environmental Shop	129 1981-Pres.	--	X		Consumed in use
Structural Shop	5045 1981-Pres.	--	X		Consumed in use

[a]MASDC industrial operations were located in the Runway No. 4 area prior to 1960; the buildings no longer exist.

Appendix F
INVENTORY OF EXISTING POL STORAGE TANKS

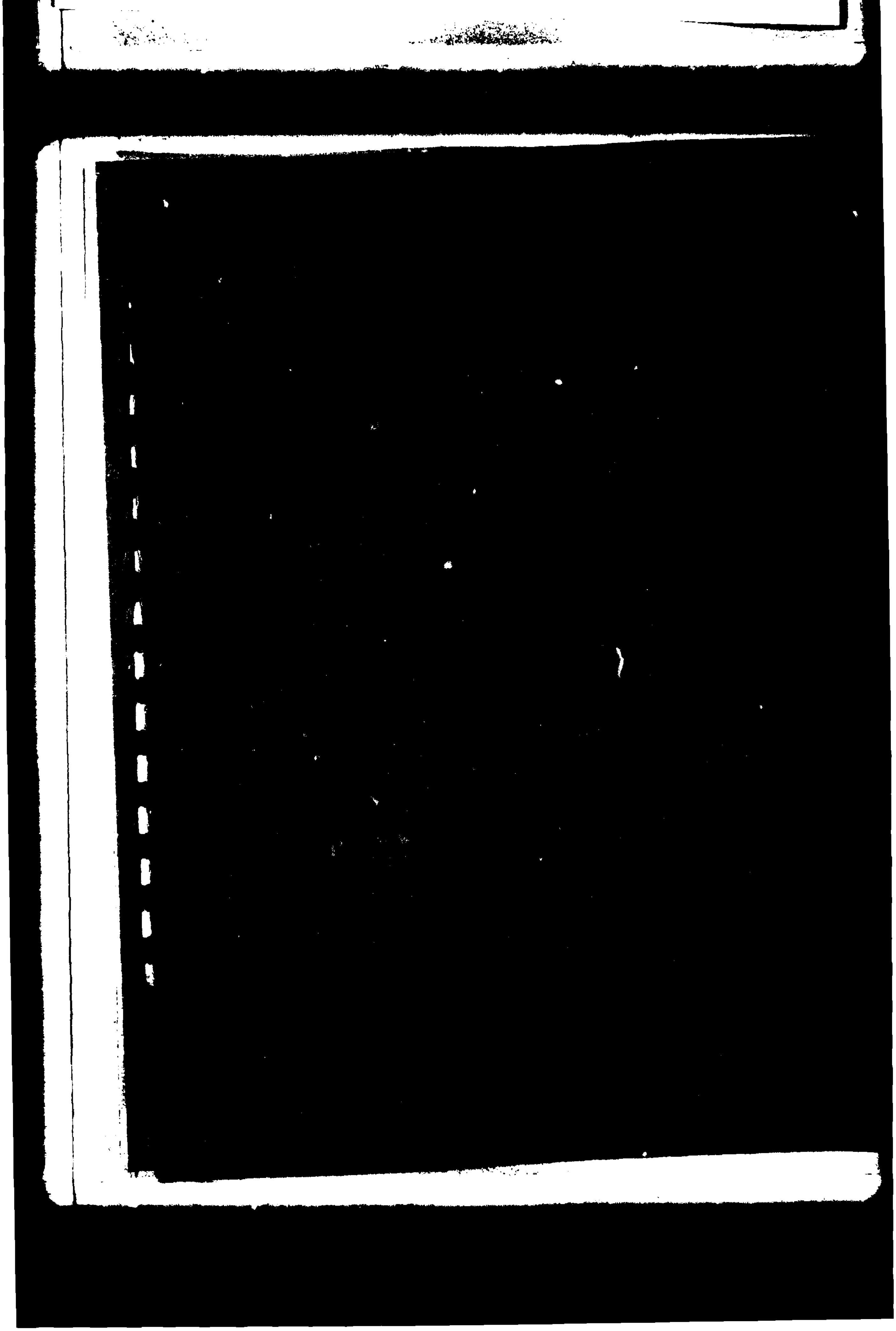
Facility No.	Type Pol	Capacity (gal)
215	JP-4	2,500
4883	Diesel	2,000
4712	JP-4	5,000
4712	MOGAS	5,000
4712	MOGAS	5,000
217	JP-4	2,500
P-1	JP-4	2,500
224	JP-4	5,000
224	JP-4	1,000
2663	Kerosene	4,000
5251	JP-4	1,000
4432 No. 1	MOGAS	10,000
4432 No. 2	MOGAS	10,000
4432 No. 4	MOGAS	10,000
2513 No. 1	MOGAS	10,000
2513 No. 2	MOGAS	4,000
2513 No. 3	MOGAS	10,000
2513 No. 4	MOGAS	10,000
115	JP-4	2,847,500
115	JP-4	2,847,500
115	JP-4	2,847,500
115	Empty	2,295,000
115	Empty	2,295,000
4310	Diesel	1,000
4852	Diesel	2,000
203	Diesel	4,260
4883	Diesel	2,000
PB-2	10/10 Oil	15,000
PB-2	10/10 Oil	13,200
PB-2	10/10 Oil	12,000
PB-2	JP-4 Residue	8,000
PB-2	Solvent	4,500
183	10/10 Oil	1,000
187	10/10 Oil	3,000
265	10/10 Oil	1,000
140	10/10 Oil	2,000
401	10/10 Oil	7,000
401	10/10 Oil	7,000
7222	MOGAS	5,000
7222	MOGAS	5,000
7222	JP-4	5,000
7045	Solvent	1,500
5122	MOGAS	5,000
5122	MOGAS	5,000
5122	JP-4	5,000
PB-151	100/130	5,000
7401C	Solvent	1,800
4882	Waste Oil	4,000
4880	Waste Oil	12,000

Appendix F--Continued

Facility No.	Type Pol	Capacity (gal)
7337 No. 5	MOGAS	3,000
7337 No. 6	MOGAS	3,000
7337 No. 7	MOGAS	5,000
4707 No. 1	MOGAS	5,000
4707 No. 2	MOGAS	5,000
4707 No. 3	MOGAS	5,000
4707 No. 4	Diesel	5,000
J-3 Pumphouse No. 1	JP-4	40,000
J-3 Pumphouse No. 2	JP-4	40,000
J-3 Pumphouse No. 3	JP-4	40,000
J-3 Pumphouse No. 4	JP-4	40,000
J-3 Pumphouse No. 5	JP-4	40,000
J-3 Pumphouse No. 6	JP-4	40,000
J-3 Pumphouse No. 7	JP-4	40,000
J-3 Pumphouse No. 8	JP-4	40,000
J-3 Pumphouse No. 9	JP-4	40,000
J-3 Pumphouse No. 10	SLOP	50,000
A-2 Pumphouse No. 1	AVGAS	40,000
A-2 Pumphouse No. 2	MOGAS	40,000
A-2 Pumphouse No. 3	AVGAS	40,000
A-2 Pumphouse No. 4	MOGAS	40,000
A-2 Pumphouse No. 5	Diesel	50,000
3426	Diesel	275
171	Diesel	570
307	Diesel	300
313	Diesel	600
314	Diesel	500
348	Diesel	500
338	Diesel	500
5315	Diesel	300
7610	Diesel	275
114	Diesel	300
123	Diesel	250
124	Diesel	250
184	Diesel	750
1639	JP-4	500
139	JP-4	850
139	JP-4	500
4437	MOGAS	275
Missile Sites:		
570-1	Diesel	8,000
570-2	Diesel	8,000
570-3	Diesel	8,000
570-4	Diesel	8,000
570-5	Diesel	8,000
570-6	Diesel	8,000
570-7	Diesel	8,000

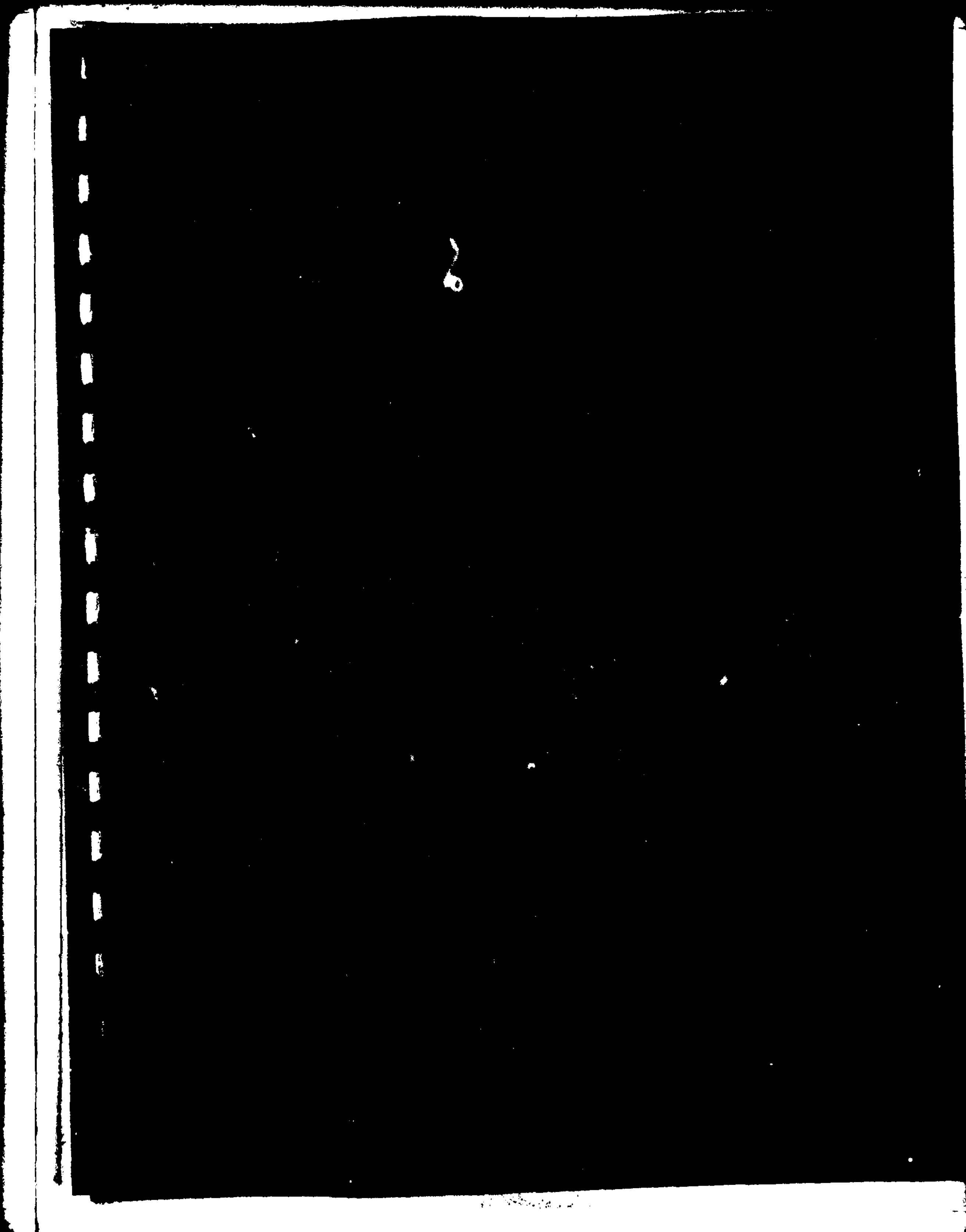
Appendix F--continued

Facility No.	Type Pol	Capacity (gal)
570-8	Diesel	8,000
570-9	Diesel	8,000
571-1	Diesel	8,000
571-2	Diesel	8,000
571-3	Diesel	8,000
571-4	Diesel	8,000
571-5	Diesel	8,000
571-6	Diesel	8,000
571-7	Diesel	8,000
571-8	Diesel	8,000
571-9	Diesel	8,000



Appendix G
DEACTIVATED POL STORAGE TANK LOCATION SUMMARY

Facility No.	Type POL Previously Stored	Number of Tanks	Capacity Per Tank (Gal)	Type Tank
201 (Pumphouse A-1)	AVGAS	5	50,000	Underground
204 (Pumphouse J-1)	JP-4	10	50,000	Underground
205 (Pumphouse J-2)	JP-4	10	50,000	Underground
207 (Pumphouse J-4)	JP-4	10	50,000	Underground



Appendix H

PARAMETERS PREVIOUSLY ANALYZED FOR IN THE DAVIS-MONTHAN AFB SANITARY SEWER SYSTEM

Chemical Oxygen Demand
Oil and Grease
Cyanide
Free Cyanide
Phenols
Arsenic
Barium
Cadmium
Chromium
Hexavalent Chromium
Copper
Lead
Manganese
Mercury
Nickel
Selenium
Silver
Zinc
Tin
Molybdenum
Boron
Surfactants
Gross Alpha
Gross Alpha Suspended
Gross Beta
Gross Beta Suspended
Gross Gamma

Trichloroethylene
Total Organic Carbon
Ammonia
Nitrate
Nitrite
Total Kjeldahl Nitrogen
Phosphorus
Iron
Magnesium
Potassium
Sodium
Chloride
Color
Fluoride
Filterable Residue
Non-Filterable Residue
Total Residue
Volatile Residue
Specific Conductance
Sulfate
Turbidity
Potassium 40
Uranium 238
Thorium 232
Uranium 235
Iodine 131
pH

Appendix I
INVENTORY OF OIL/WATER SEPARATORS

Location	Type
Facility 224	Flotation
Facility 1360	Flotation
Facility 1440	Flotation
Facility 2514	Flotation
Facility 4705	Flotation
Facility 4711	Flotation
Facility 4712	Flotation
Facility 4809	Flotation
Facility 4812	Flotation
Facility 4821	Flotation
Faciilty 5045	Flotation
Facility 5206	Flotation
Facility 5251	Flotation
Facility 5422	Flotation/Aeration
Facility 5607	Flotation
Facility 7222	Flotation
Facility 7340	Flotation
Facility 7402	Flotation/Aeration
Facility 7426	Flotation/Aeration
Facility 7447	Flotation

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M HILL The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering

Science, and CH2M HILL met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the

policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1). The site rating form is provided in Figure 2 and the rating factor quidelines are provided in Table 1.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, the potential pathways for waste contaminant migration, and any efforts to contain the contamination. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant, and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface-water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated [illegible] highest score among all four of the potential s[illegible] used.

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The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

SITE RATING METHODOLOGY FLOW CHART

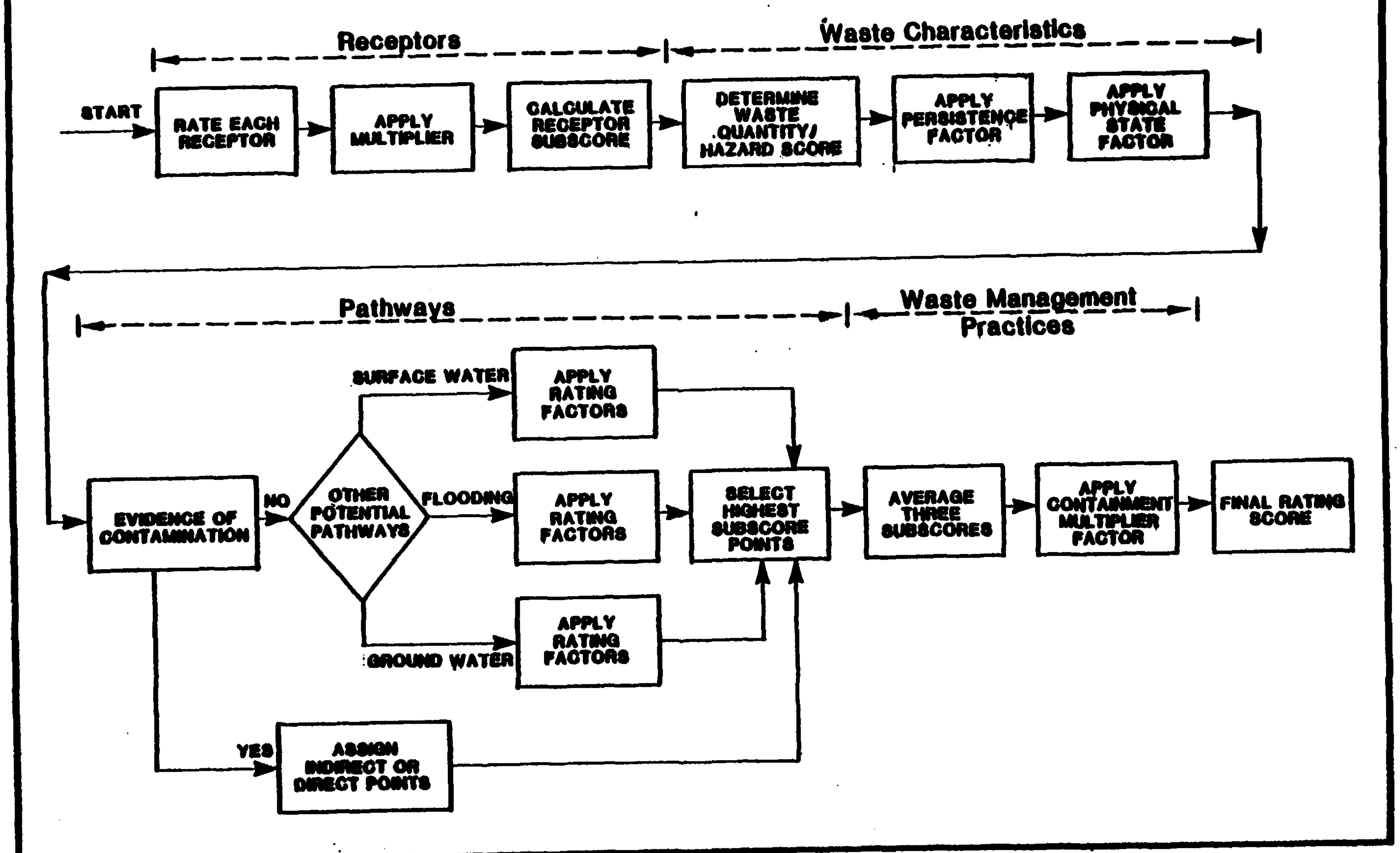

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ______

LOCATION ______

DATE OF OPERATION OR OCCURRENCE ______

OWNER/OPERATOR ______

COMMENTS/DESCRIPTION ______

SITE RATED BY ______

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
Subtotals			______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
Subtotals			______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
Subtotals			______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______ Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	3
D. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE [illegible] (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	H
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well [illegible]	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 1, Main Base Landfill

LOCATION: Davis-Monthan AFB Grid 17C & 18C

DATE OF OPERATION OR OCCURRENCE: 1940's to 1976

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Main Sanitary Landfill for Entire Base

SITE RATED BY: Greg McIntrye and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	1	10	10	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	80	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 44

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L

2. Confidence level (C = confirmed, S = suspected) C

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state ultiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore -

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	0	1	0	100
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	44
Waste Characteristics	100
Pathways	52
Total 196 divided by 3 =	65

Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

65 x 1.0 = 65

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 2 MASDC Landfill

LOCATION: Davis-Monthan AFB Grid 33.5, 0.8

DATE OF OPERATION OR OCCURRENCE: 1940's to 1955

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Sanitary Landfill for Housing Area

SITE RATED BY: Greg McIntrye and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	3	4	12	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	111	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

30 x 1.0 = 30

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

30 x 1.0 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	-
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	N/A	1	-	-
	Subscore (100 x factor score/3)			-
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62
Waste Characteristics	30
Pathways	52
Total 144 divided by 3 =	48
	Gross Total

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

48 x 1.0 = 48

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 3 - Existing Fire Department Training Area

LOCATION: Davis-Monthan AFB Grid 26.2, G.8

DATE OF OPERATION OR OCCURRENCE: 1968 to Present

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Currently Used for Fire Department Training Exercises

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6.	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	94	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	-
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	0	1	0	100
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore **52**

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	60
Pathways	52
Total 164 divided by 3 =	55
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

55 x 1.0 = **55**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 4 Northramp Fire Department Training Area

LOCATION: Davis-Monthan AFB Grid 6.4, G.5

DATE OF OPERATION OR OCCURRENCE: 1950 to 1968

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: One Used for Fire Department Training Exercises

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	93	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	-
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	48	108
Subscore (100 x factor score subtotal/maximum score subtotal)				44
2. Flooding	0	1	0	100
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore **44**

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	60
Pathways	44
Total 156 divided by 3 =	52
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

52 x 1.0 = **52**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 5 Abandoned Fire Department Training Area

LOCATION: Davis-Monthan AFB Grid

DATE OF OPERATION OR OCCURRENCE: 1940's to 1950

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Site Once Used for Fire Department Training Exercises

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	3	4	12	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	105	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore -

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	0	1	0	100
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	58
Waste Characteristics	40
Pathways	52
Total 150 divided by 3 =	50

Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

50 x 1.0 = 50

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 7 - Old Electrical Substation

LOCATION: Davis-Mothan AFB Grid 20.2, 1.9

DATE OF OPERATION OR OCCURRENCE: 1964

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Blown Transformers During Electrical Storm

SITE RATED BY: Greg McIntrye and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	97	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 54

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

70 x 1.0 = 70

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

70 x 1.0 = 70

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	-
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	0	1	0	100
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore **52**

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	54
Waste Characteristics	70
Pathways	52
Total 176 divided by 3 =	59
	Gross Total Scor

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

59 x 1.0 = **59**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 8 - Transformer Oil Spill Site

LOCATION: Davis-Monthan AFB Grid 21.4, H.6

DATE OF OPERATION OR OCCURRENCE: 1978

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Spill Occurred Behind Building 4852

SITE RATED BY: Greg McIntrye and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	97	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 54

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

50 x 1.0 = 50

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore -

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	0	1	0	100
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	54
Waste Characteristics	50
Pathways	52
Total 156 divided by 3 =	52
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

52 x 1.0 = 52

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 10 - Chemical Sludge Burial Site

LOCATION: Davis-Monthan AFB Grid 18.8, C.3

DATE OF OPERATION OR OCCURRENCE: 1970 to 1976

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Suspect Fuel Tank Sludge

SITE RATED BY: Greg McIntrye and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	1	10	10	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	80	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 44

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore -

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	48	108
Subscore (100 x factor score subtotal/maximum score subtotal)				44
2. Flooding	0	1	0	100
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 44

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	44
Waste Characteristics	80
Pathways	44
Total 168 divided by 3 =	56
	Gross Total Scor

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

56 x 1.0 = 56

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 17 MASDC Firebottle Drainage Ditch

LOCATION: Davis-Monthan AFB Grid 43.6, Q.5

DATE OF OPERATION OR OCCURRENCE: 1972

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Dislodged Aircraft Fire Bottles Into Ditch

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	1	10	10	30
C.	Land use/zoning within 1 mile radius	0	3	0	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	64	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 36

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	-
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	N/A	1	-	100
	Subscore (100 x factor score/3)			-
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	36
Waste Characteristics	80
Pathways	52
Total 168 divided by 3 =	56
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

56 x 1.0 = 56

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 18 MASDC Flush Farm Drainage Ditch

LOCATION: Davis-Monthan AFB Grid 31.4, K.7

DATE OF OPERATION OR OCCURRENCE: 1970 to Present

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Waste Oil Spill Site; Washdown Water - Flush Farm

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	97	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 54

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	N/A	1	-	100
	Subscore (100 x factor score/3)			-
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	54
Waste Characteristics	48
Pathways	80
Total 182 divided by 3 =	61
	Gross Total Scor

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

61 x 1.0 = 61

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 19, Runway No. 4 - Drainage Ditch

LOCATION: Davis-Monthan AFB Grid 21.4, P.6

DATE OF OPERATION OR OCCURRENCE: 1950's

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Disposal of Waste Oils and Residual Fuel

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	3	4	12	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	111	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.80 = 64

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	-
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	N/A	1	-	100
		Subscore (100 x factor score/3)		-
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62
Waste Characteristics	64
Pathways	52
Total 178 divided by 3 =	59
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

59 x 1.0 = 59

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 20 Storm Sewer Outfall Location No. 1

LOCATION: Davis-Monthan AFB Grid 10.1, K.8

DATE OF OPERATION OR OCCURRENCE: 1940's to Present

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Receives Storm Drainage from Main Base Area

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	2	10	20	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	83	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 46

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H.

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

70 x 1.0 = 70

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

70 x 1.0 = 70

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore -

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	N/A	1	-	100
		Subscore (100 x factor score/3)		-
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	46
Waste Characteristics	70
Pathways	52
Total 168 divided by 3 =	56
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

56 x 1.0 = 56

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 21 Storm Sewer Outfall Location No. 2

LOCATION: Davis-Monthan AFB Grid 7.2, J.3

DATE OF OPERATION OR OCCURRENCE: 1940's to Present

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Receives Storm Drainage from Main Base Area

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	93	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

70 x 1.0 = 70

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

70 x 1.0 = 70

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	-
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	N/A	1	-	100
	Subscore (100 x factor score/3)			-
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	70
Pathways	52
Total 174 divided by 3 =	58
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

58 x 1.0 = 58

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 25, MASDC Tow Road

LOCATION: Davis-Monthan AFB Grid -

DATE OF OPERATION OR OCCURRENCE: 1950's to 1976

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Road Oiling of Tow Road

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	103	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

70 x 1.0 = 70

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

70 x 1.0 = 70

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore -

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	0	1	0	100
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	70
Pathways	52
Total 179 divided by 3 =	60

Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

60 x 1.0 = 60

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 26, Fuel Tank Sludge Burial Site

LOCATION: Davis-Monthan AFB Grid 27.9, J.1

DATE OF OPERATION OR OCCURRENCE: Prior to 1970

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Burial of Weathered Sludge

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	90	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 0.75 = 45

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore -

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	0	1	0	100
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	45
Pathways	52
Total 147 divided by 3 =	49
	Gross Total Scor

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

49 x 1.0 = 49

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Wastewater Drainage Ditch - Typical Remote Titan Site

LOCATION: Davis-Monthan AFB, Titan Missile Site

DATE OF OPERATION OR OCCURRENCE: 1960 to Present

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Dry Sump Pumped to Drainage Ditch

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	0	3	0	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	90	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	-
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	0	1	0	100
	Subscore (100 x factor score/3)			0
3. Ground-water migration				-
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore **52**

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	40
Pathways	52
Total 142 divided by 3 =	47
	Gross Total Scor

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

47 x 1.0 = **47**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Wastewater Drainage Ditch - Typical Encroached Titan Site

LOCATION: Davis-Monthan AFB, Titan Missile Site

DATE OF OPERATION OR OCCURRENCE: 1960 to Present

OWNER/OPERATOR: Davis-Monthan AFB

COMMENTS/DESCRIPTION: Dry Sump Pumped to Drainage Ditch

SITE RATED BY: Greg McIntyre and Norm Hatch

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	2	9	18	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	99	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 55

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	-
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	56	108
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	0	1	0	100
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	-	-
		Subtotals	16	90
Subscore (100 x factor score subtotal/maximum score subtotal)				18

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 52

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	55
Waste Characteristics	40
Pathways	52
Total 147 divided by 3 =	49
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

49 x 1.0 = 49